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I.E.E. Regulations for Ships.

A PAMPHLET of 17 pages containing important alterations to the second edition of the Institution of Electrical Engineers' Regulations for the Electrical Equipment of Ships has been issued. The changes were approved by the I.E.E. Council on July 4th, 1929; the second edition to which these alterations apply was published in 1926, and the chief reason for their issue then was to make the phraseology of definitions and some of the Regulations agree with the eighth edition (1924) of the Regulations for the Electrical Equipment of Buildings.

The present pamphlet is not primarily designed to bring the Ship Regulations into line with the current and ninth edition (1927) of the Building Regulations as we might perhaps have expected. The alterations apply chiefly to switchboards and cables, and there is an excellent appendix relative to the means of preventing electrical disturbance to ships' wireless, direction finders, and other apparatus employing thermionic valves. A second appendix comprises a specification for tests applicable to the compound insulating materials now used so much for switchboard bases, especially on board ships, where their qualities of lightness combined with toughness give them preference over slate or marble.

Five tables are included: two of them are fusing current tables taken from the present edition of the Building Regulations, and the others deal with sizes of varnished-cambric cables and tough-rubber-sheathed cables. It is noted that the use of varnished-cambric cables is not advocated, and they are permitted only if installed under conditions which are stated.

The alloy of lead, tin, and cadmium, which is recommended for situations where there is persistent and serious vibration, is the subject of a British patent. This, so far as we can recollect, is the first occasion on which a specific patent has been referred to in I.E.E. Wiring Regulations. The use of a lead alloy sheathing for marine cable is now recommended, apparently in preference to a covering of commercially pure lead, and the pamphlet describes suitable alloys which will withstand vibration.

The alterations demand that every lead-covered or armoured cable, except final sub-circuit cables, shall be

efficiently earthed at both ends. This requirement differs from the usual land practice and is forbidden in the case of mine installations. The reason, of course, is that in marine work electrolysis is to be feared and good earthing points are plentiful.

Motors essential to the ship's safety must be capable of running for a reasonable period after the compartment in which they are situated is flooded.

The fact that now almost every tug, trawler, yacht, fishing boat, and similar small vessel has electric light has forced an increased range of pressures, and the pamphlet fixes the standard voltage for these classes of craft at 12, 50, and 110 volts.

Floating installations are becoming increasingly difficult to legislate for, and rapid development necessitates periodic modification of rules. The special Committee responsible for these Regulations and its chairman (Lt.-Col. A. P. Pyne) are to be congratulated on the scope and arrangement of the alterations and additions to the Electrical Regulations for Ships.

Large-scale Thermal-storage Heating.

There is always a tendency for an important prevalent development to overshadow other, perhaps equally or more important, issues. Bearing this in mind, it is as well at present, when the thoughts of supply engineers are occupied with the problems of domestic thermal-storage heating, not to overlook the possibilities of supplying electricity for the same purpose in connection with the heating of large buildings. The value to the supply undertaking of an off-peak load of several hundred or, it may be, thousand kW of load in one installation can hardly be over estimated, and even an inefficient station could afford to provide for such a demand on favourable terms to the consumer.

It may be thought at first that the field for the development of such work is small, but it should be remembered that all towns of moderate size have their large public buildings, and the local Town Hall should be easy prey for the municipal engineer armed with the right argument for the advancement of municipal enterprise.

The latest example of large electric thermal-storage installations brought to our notice is that at the new headquarters of the London Underground Railways, to which we refer fully elsewhere in this issue. While the L.U.R. installation differs from the scheme that is and probably will be generally followed, in that it is designed for the requirements peculiar to the Underground Railways supply system and has to be off circuit for two four-hour periods each working day, the broad principles are such as would serve for any thermal-storage scheme. One of the most interesting features of the installation in question is the use of immersion heaters. While we are not prepared to discuss the question of immersion heaters *versus* electrodes, we are impressed by the fact that the former method has proved, in the case of the installation at the Railway Headquarters, a practical, technical, and commercial proposition. The unique system of control employed is, perhaps, the outstanding feature of the installation, and, by virtue of its combined efficaciousness and simplicity, it represents a big advance in design.

Control is possible within fine limits that would not be possible with any other system of heating, and great credit is due to the engineer and manufacturers responsible for the scheme.

The Electrical Industry in France.

Mr. Jean-Henri Adam, secretary general of the Compagnie Parisienne de Distributions d'Electricité, contributes an interesting and exhaustive review of the electrical industry in France during 1928 to a recent issue of "La Revue d'Economie Politique." Mr. Adam points out that following the slowing down which occurred in 1927, when France was adapting herself to the new conditions set up by the standardisation of the exchange value of the franc, there has been a marked improvement in the economic position of the country in which the electrical industry has shared. He shows that the output of electric power in France increased from 7,490 million kWh in 1923 to 11,875 million kWh in 1927, 6,930 million kWh of the latter total being provided by steam power stations and 4.945 million kWh by hydro-electric plant.

The past year, 1928, witnessed a very marked increase in consumption, particularly in the Paris district where the output of the four supplying undertakings advanced from 1,586 million kWh in 1927 to 1,796 million kWh last year, an increase of 13 per cent. The progress is all the more noteworthy when it is pointed out that the consumption in the Paris area in 1920 only totalled 534 million kWh. In a section dealing with the subject of fuel supplies, the author points out that the power stations in the Paris area last year consumed 1,449,000 tons of coal, as against 1,335,000 tons in 1927, over 75 per cent. of the total being supplied by French collieries at prices which are practically the same as those ruling in pre-war days, a factor which has been of value in developing, by relatively low prices, the use of electricity for lighting and power purposes. The average rate per kWh for lighting purposes has fallen all over France during the past two years. Paris is the highest with 1 fr. 68 c. (about 3¼d.) per kWh, while Grenoble is the cheapest with 95 centimes (about 1.84d.).

Despite the lower prices most of the principal generation and distribution companies were able last year to make increased net profits, the increase in the Paris area being 5.4 per cent., in the south-west of France 19 per cent., and at Havre 16.8 per cent.

Mr. Adam also deals with the financial position of French electricity concerns, the progress of rural electrification, and the development of distribution system inter-connection systems in France. As regards rural electrification, he points out that whereas at the end of the war only 7,000 towns and villages in the country were being supplied with electricity, the number at the beginning of 1928 was 20,907; in other words, 55 per cent. of the communes of France and 80 per cent. of the population have a supply of the electricity available.

The Sussex Downs.

It is impossible not to sympathise with those who work to save our English landscape from disfigurement. We believe, however, that the agitation against the proposed overhead lines of the Central Electricity Board in Sussex is based upon a misconception. The first 132-kV line in England has been erected for some time between Little Barford and Bedford, and, although the terrain is flat, the line is unobtrusive. It would be still less visible in so undulating a county as Sussex.

But, in any case, are the Blomfield towers ugly? We think decidedly not, and we believe posterity will accept them as a not unlovely portion of its heritage in civilisation. There are, it is true, people who regard anything of utilitarian value as necessarily sordid. Such a view seems to us to be merely sentimental and devoid of any æsthetic value.

Quite another view was recently expressed by a correspondent to *The Times*, who stated the case for the countryman himself. The pseudonym of the writer—"Ignotus"—seems especially well chosen as voicing what must be the feelings of thousands of the unknown, to whom electricity will bring freedom from much of the drudgery which townsfolk have never experienced. He believes that a steel mast, is "rightly regarded, a thing of beauty and with spiritual value." From the context we assume this to mean that men who have not to perform wearisome and soul-destroying tasks are better able to appreciate the deeper significance of their natural surroundings.

Developments in Buenos Aires.

With especial reference to the new power station of the "Chade."

(COMMUNICATED).

THE public supply of Buenos Aires is undertaken by the Spanish-American Company and by the Italo-Argentina Company. The average monthly consumption is about 18,000,000 kWh for lighting, 16,000,000 for motive power, and 8,000,000 for traction. The erection of new stations is in prospect in several centres, and there is also substantial business to be done in connection with the domestic electrical equipment required for the various municipal housing schemes which are being developed in almost every Argentine town of importance. In Buenos Aires alone a large number of new dwellings is to be erected in the near future, and new public buildings are also under construction in Rosario, Mendoza, Bahia Blanca, and other important centres. Nearly all will be electrically lighted, so that it will be seen that, in view of this, the installation of electrical port equipment and the provision of general lighting facilities in a number of towns, the Argentine merchant handling electrical machinery and accessories has a busy time in immediate prospect.

The latest and most important electrical development in Buenos Aires itself is the new super-power station of the Compañia Hispano-Americana de Electricidad, commonly known in this country as the "Chade." The site of the power station on the boundary of the new port of Buenos Aires was chosen with a view to convenience of access by overseas carriers, and with due regard for the fact that an unlimited supply of water for condensing purposes was thereby guaranteed. It is also situated in convenient proximity to the most thickly populated centre of the Federal Capital. The new power station has been built on land reclaimed from the River Plate, the total area of the site being approximately 40 acres. Of this area about nine acres were ceded to the National Government, so that the total area of the property of the "Chade" is a little more than 30 acres. Room has been left for extensions, as the ultimate capacity of the installation will be 1,000,000 h.p.

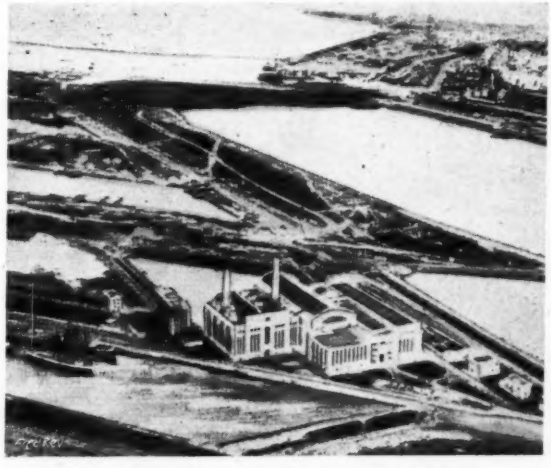


Fig. 1.—View of the "Chade" Power Station.

The work of construction of the power plant was commenced in January, 1927, and the first sections of the metallic building structure were assembled in the middle of that year. The upper structure of the building was brought near to completion in September, 1927, two and a half months later the boilers were installed, and in January, 1928, work was commenced on the installation of the turbines. At that time the assembly of the mechanism and installation for the handling of fuel was undertaken, and on December 29th, 1928, the first turbine of 75,000 h.p. was under steam. For the foundations and superstructure 60,000 cubic metres of reinforced concrete were required. The present buildings cover an area of 16,000 square metres.

The installation for the hoisting and conveyance of the coal represents the last word in economy and efficiency. By means of winches and belt conveyors the coal is taken as required to the high central point over the pulverising installation. The pulverising station consists of five mills, each with a pulverising capacity of 15 tons an hour, corresponding to a power unit of 30,000 h.p. The boiler-room installation consists of 8 boilers, with an aggregate capacity of 150,000 h.p. Six of the boilers are of a normal type, being intended solely to produce steam, but the other two are fitted with secondary heaters for superheating (from 450 deg. to 770 deg. Fahr.), the steam discharged from the high-pressure cylinders of the turbines. The base of the engine doom lies 7 metres below the ground level and is 47 metres high and 36 wide. This room will hold 12 turbo-alternators, and thus far Nos. 1 and 3, each of 75,000 h.p., have been installed, the speed of which are 1,500 r.p.m. They are the most powerful turbines that have thus far been brought into use in South America. The pipes of the circulating water systems are one and a half metres in diameter. The building accommodating the principal switches consists of five floors. At the sub-station transformers of 54,350 kVA each, raise the generation voltage from 13,200 to 27,500 volts. Each transformer contains 20,000 kilogrammes of oil, which is continuously water cooled. This distributing system is operated from the floor above. The control station is located in a building between the engine room and the principal switch room, and is in constant communication with the plant, sub-stations, and central offices of the company.

This brief description of the new super-power station will at least serve to give an idea of the magnitude of the "Chade's" electrical undertaking in Buenos Aires. The undertaking represents by far the largest investment of new capital which has been made in public utility undertakings in Argentina in recent years, and in all probability marks the beginning of an era of electrical improvements and developments during which the electrical services of the interior of the Republic will be enormously extended. The majority of the large electric power concerns in the Argentine are unfortunately of other than British ownership, and the tendency here is not unnaturally adverse to the purchase of British equipment. Generally speaking, British prices compare favourably with those quoted by U.S.A. manufacturers, and the competitors most to be feared in Argentina are Germany and other Continental countries. It is noteworthy, however, that there is an increasing tendency to give more regard to quality and less to low first costs in the electrical accessories trade, and this, on the whole, will be of assistance to British trade. It is beyond doubt that the use of electric power for industrial purposes and the use of all kinds of domestic electric devices and appliances in Argentina draw their standards from the Federal Capital, and the great "Chade" enterprise may, therefore, be regarded as having favourably influenced the prospects of all other electric power enterprises and the electrical trade generally throughout the Argentine Republic.

A Large Thermal Storage Scheme.

The new headquarters of the London Underground Railways has been equipped for electric water heating, with provision for storage for two daily four-hour peak-load periods.

In view of the attention which is being paid, and which is likely to be paid even more during the next few years, to the subject of electrical thermal-storage heating, the following notes on the installation at the new headquarters of the London Underground Railways, fig. 1, will probably prove of considerable interest to electricity supply engineers.

The installation is believed to be unique in some respects, principally in that it does not provide for the usual all-night storage, but is designed to be off-circuit during two four-hour peak-load periods each working day. The electricity for the scheme is taken from the organisation's 11,000-V. traction system, 33⅓ cycles, and the maximum loading for the thermal-storage installation alone is over 1,300 kW. The plant was designed and erected by Messrs. Richard Crittall and Co., Ltd., under the supervision of the engineering staff of the London Underground Railways.

The heating throughout the building is effected on the panel system originated by Messrs. Crittall, suitable piping coils through which hot water is circulated being embedded in the concrete of the ceilings. The installation is designed to provide up to 2,000,000 B.th.u. per hour, the heat energy required to maintain the building at the required temperature during the worst atmospheric conditions likely to prevail in this country, and therefore to provide for the storage of 16,000,000 B.th.u. to cover the two four-hour periods. Broadly, the installation is designed to maintain a temperature of about 65 deg. F. during 12 hours of the day and 55 deg. F. for the remaining 12 hours, when the temperature of the atmosphere outside the building is 32 deg. F.

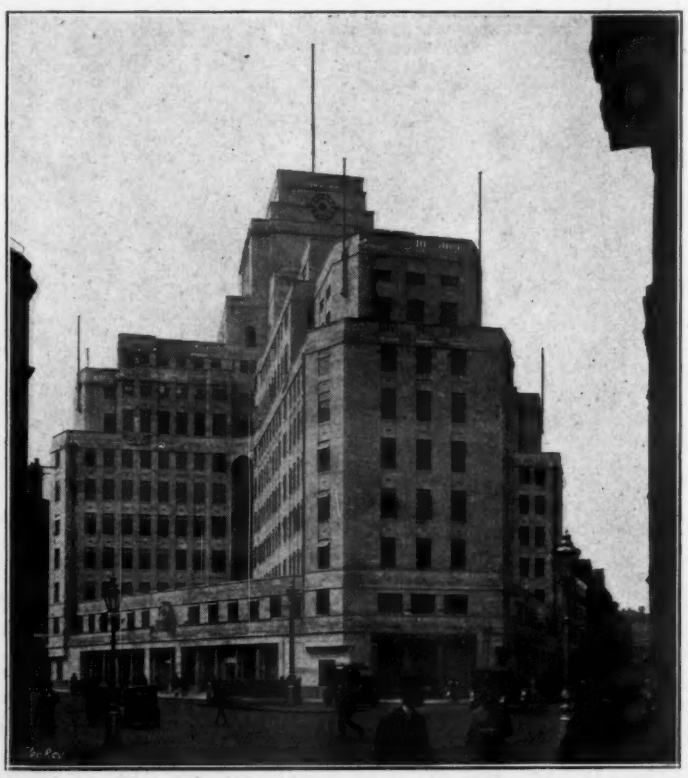


Fig. 1.—New Headquarters of the London Underground Railways.

The circulating water is heated in cylinders equipped with immersion heaters, and the heating is carried out between the limits of 300 deg. F. and 130 deg. F. The boilers are fed with water from tanks on the twelfth floor of the building under a pressure of 70 lb. per sq. in., so that the upper temperature limit is the boiling point. There are four cylinders, each with a water capacity of 4,000 gal. Three cylinders are to be actually used in normal working, the fourth acting as a spare. The dimensions of each cylinder are 10 ft. high by 9 ft. in diameter. The cylinders are constructed of ⅜-in. steel wall plates and 9/16-in. dished ends. The seams are all welded. Fig. 2 is a general view in the boiler house, showing the four cylinders and some of the auxiliaries.

The method of automatically controlling the heat put into the system from the cylinders is of particular interest. As long as the temperature of the flowing water does not fall below 130 deg. F., no water is admitted from the storage cylinders, but as soon as the temperature of the flow falls below that figure, then water is admitted. This arrangement is effected by means of a "Temperator" arranged in the pipework system and a thermostatically controlled electrically-operated valve governing the two legs of a Y inlet and outlet between the cylinders and the "Temperator." The thermostat is contained in the "Temperator," and the medium of control for the valve is a "Foster" temperature regulator, fig. 6. This controls two mercury switches, by means of which a small motor for operating the valve is governed. The mercury switches and motor are contained in one unit actually on the valve. Fig. 10 shows the "Temperator" and the electrically-operated valve. If the temperature of the flowing water does not drop to the lower setting of the "Temperator" thermostat, the water continues to circulate in the heating system only; that is to say, it does not circulate through the cylinders.

In each storage cylinder there are three 112-kW immersion heaters arranged radially around the bottom of the cylinder. Each cylinder therefore has a loading of 336 kW, and the total loading for the complete installation is 1,344 kW. Each immersion heater consists of a group of 45 tubular heaters. These each have a wire-wound element packed in a metal tube with suitable insulating material. Fig. 5 shows one of the heaters about to be inserted in a cylinder, and fig. 7 is a view of the heater in position inside the cylinder; this picture was taken looking into the cylinder from the immersion-heater hole on the opposite side of the cylinder. The immersion heaters and thermostatic control equipment were supplied by Nathan and Allen, Ltd.

The heaters are supplied at 380 V, 3-phase, and the tubes of each heater are balanced across the three phases by means of a suitable bus-bar arrangement at

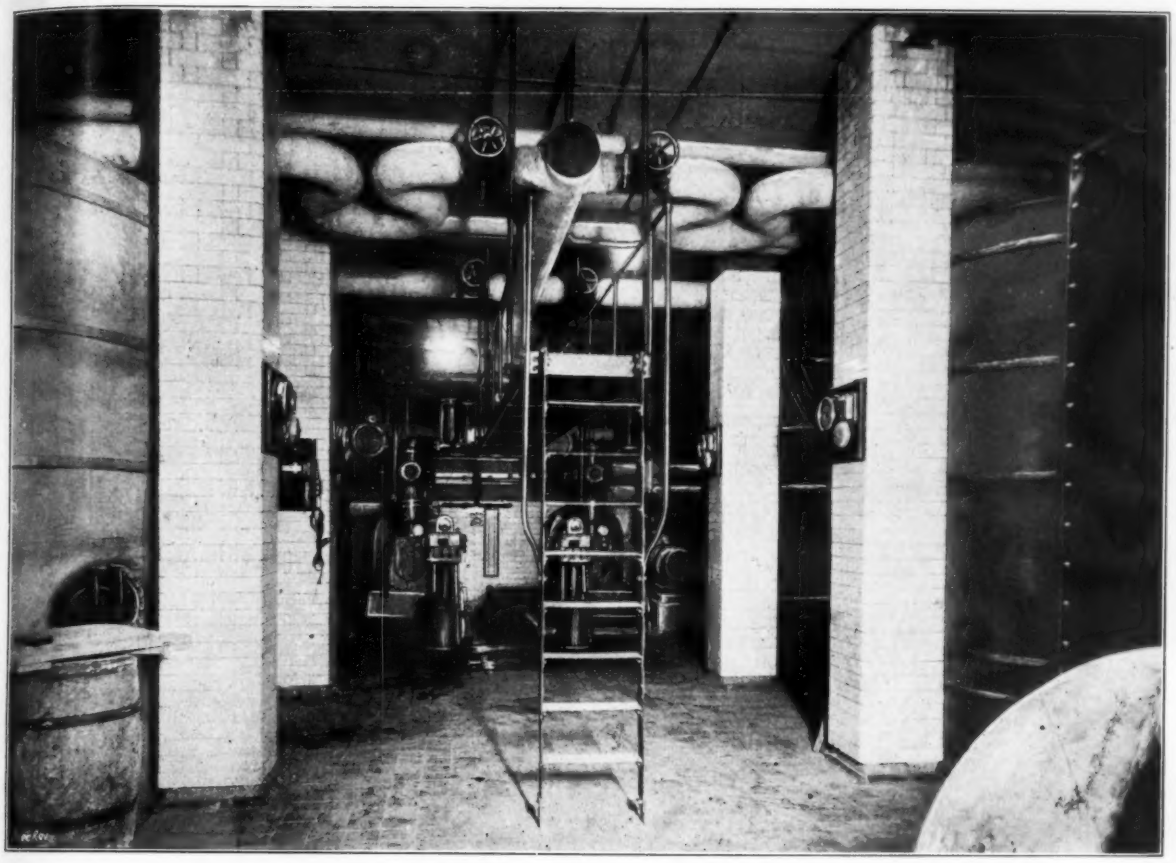


Fig. 2.—General View in Boiler Room, showing Cylinders and Auxiliaries.

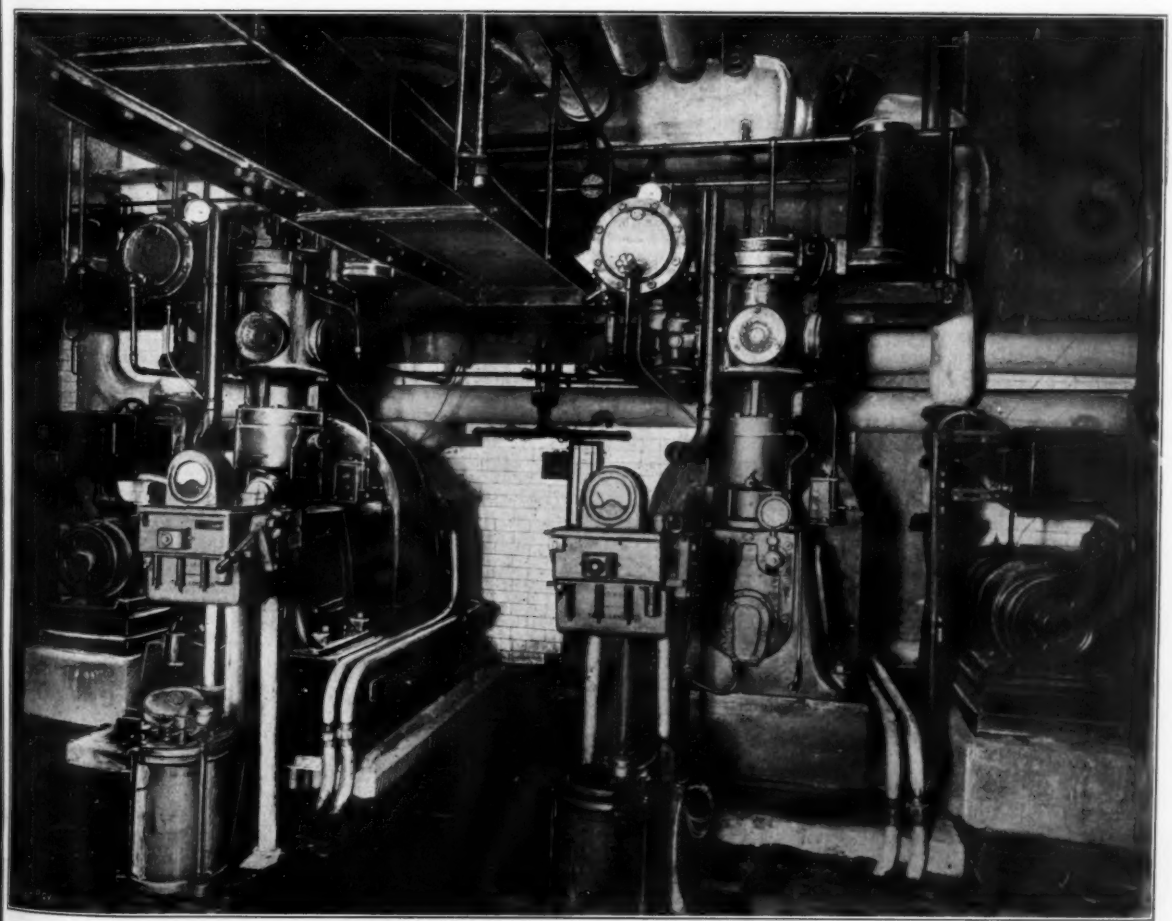


Fig. 3.—Compressors for Artesian Wells and Circulating Pumps.

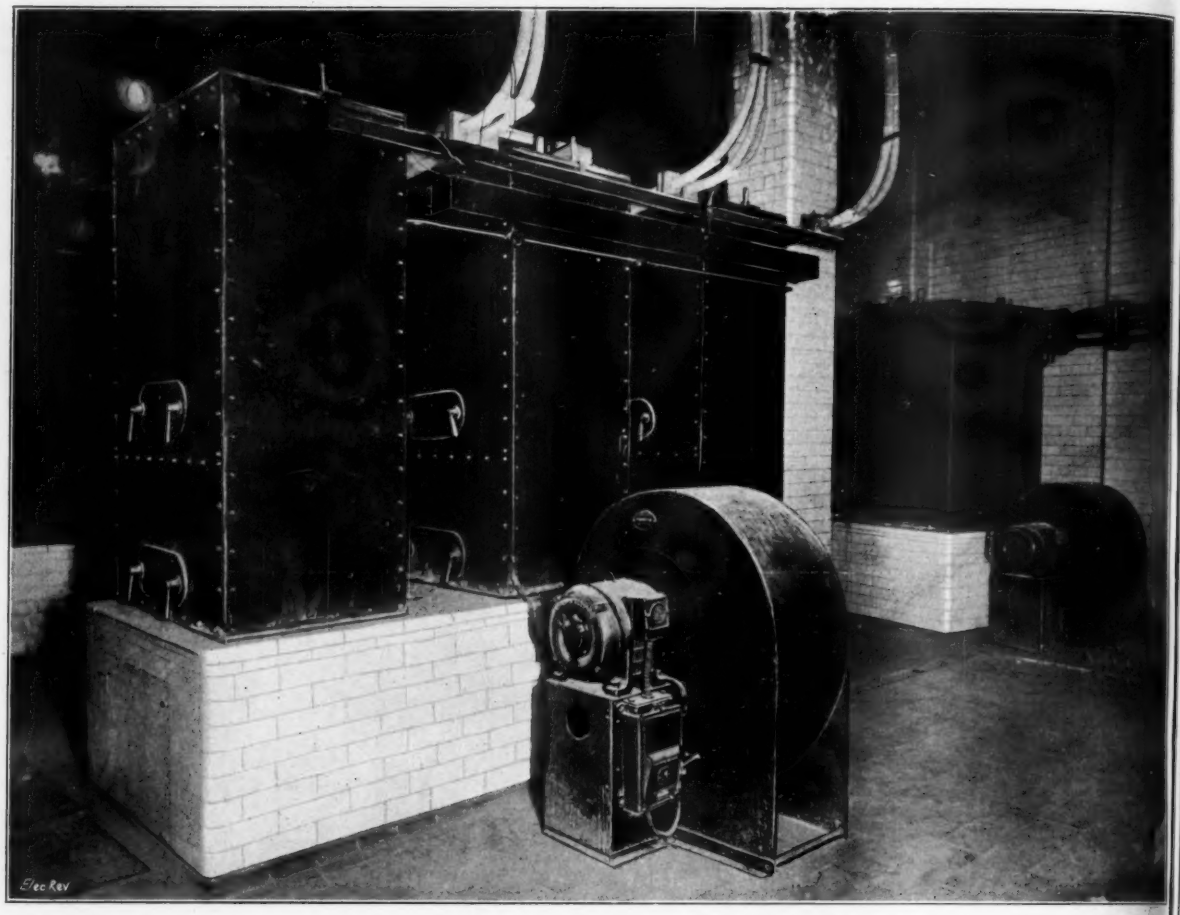


Fig. 4.—Three-phase Transformer Banks for 380-volt Supply.

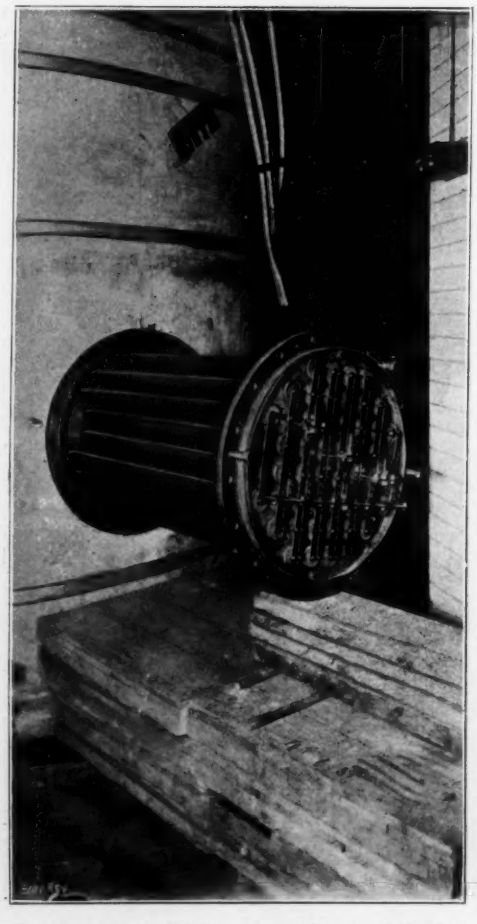


Fig. 5.—Heater Before Insertion in Cylinder.

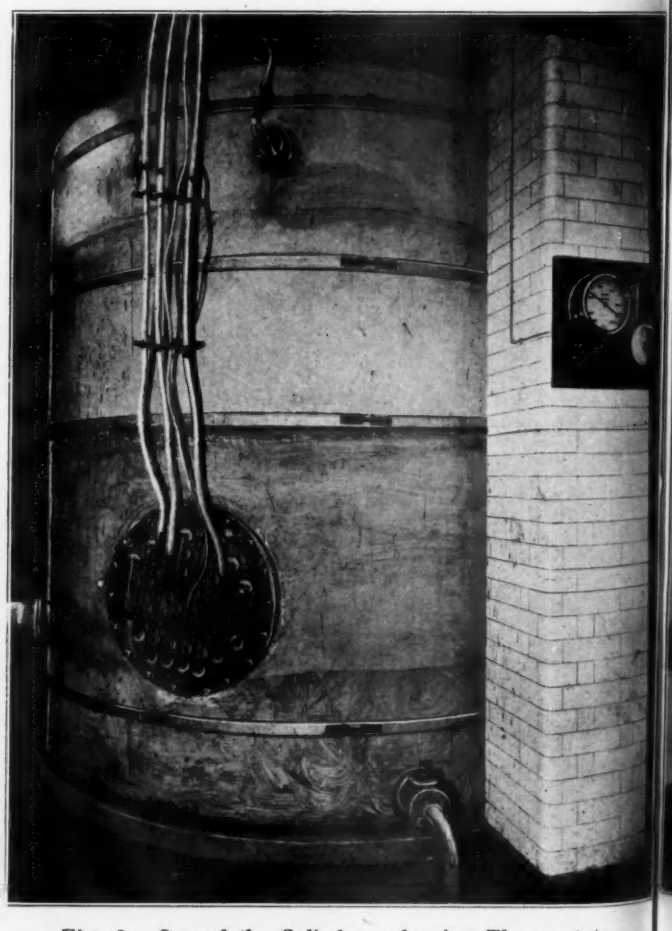


Fig. 6.—One of the Cylinders, showing Thermostats, Heater Head, and Alarm.

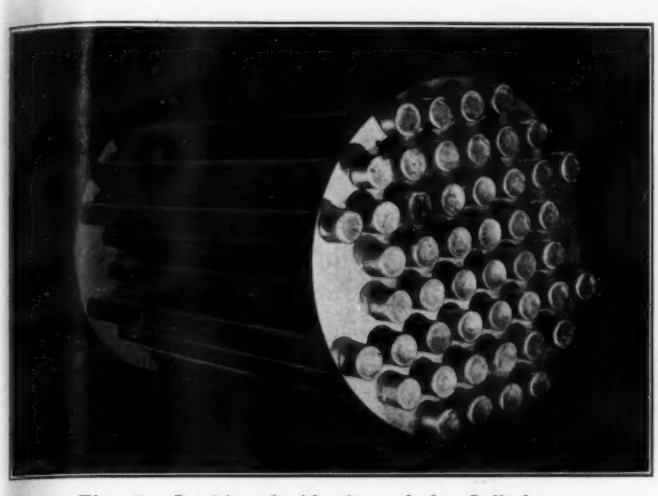


Fig. 7.—Looking Inside One of the Cylinders.

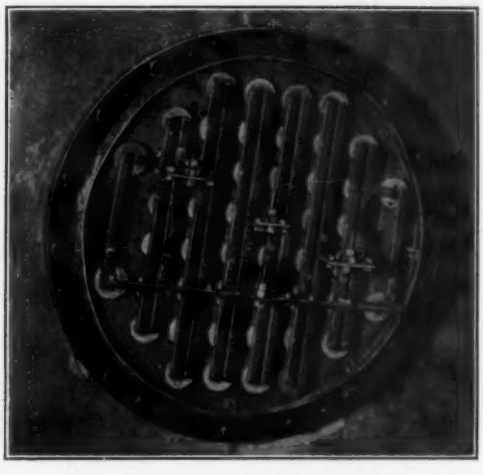


Fig. 8.—Head of Heater.

Fig. 9.—Domestic-supply Cylinders, showing Time- and Oil-switch Units.

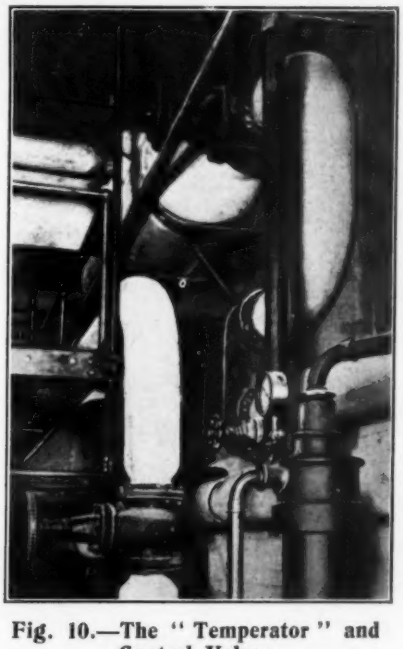


Fig. 10.—The "Temperator" and Control Valve.

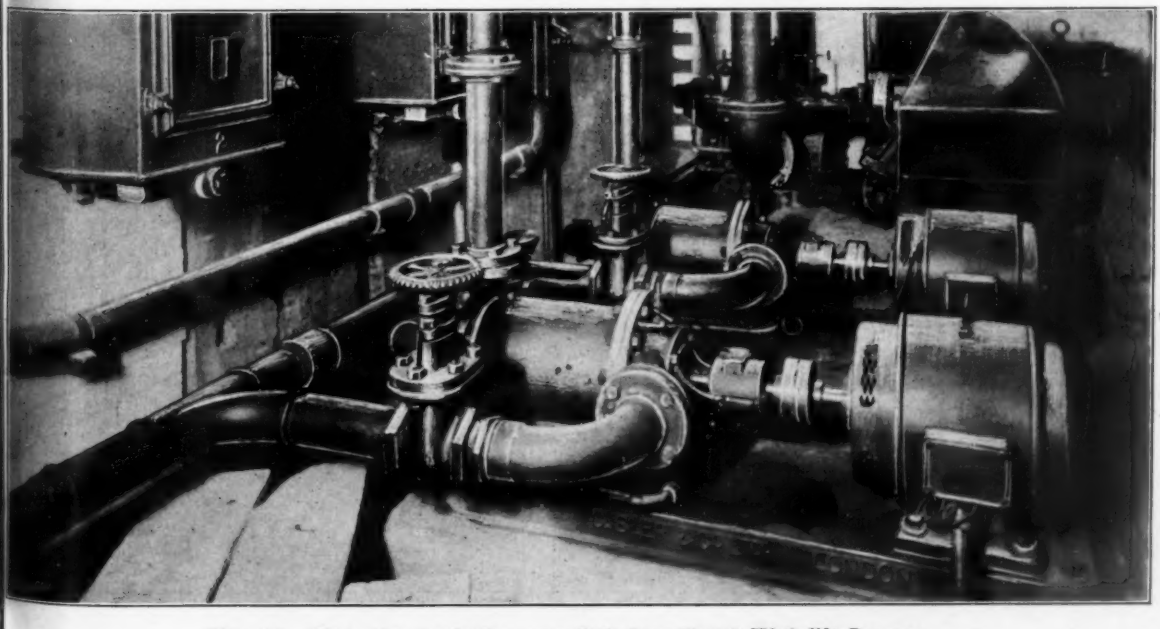


Fig. 11.—The Automatically-controlled Centrifugal High-lift Pumps.

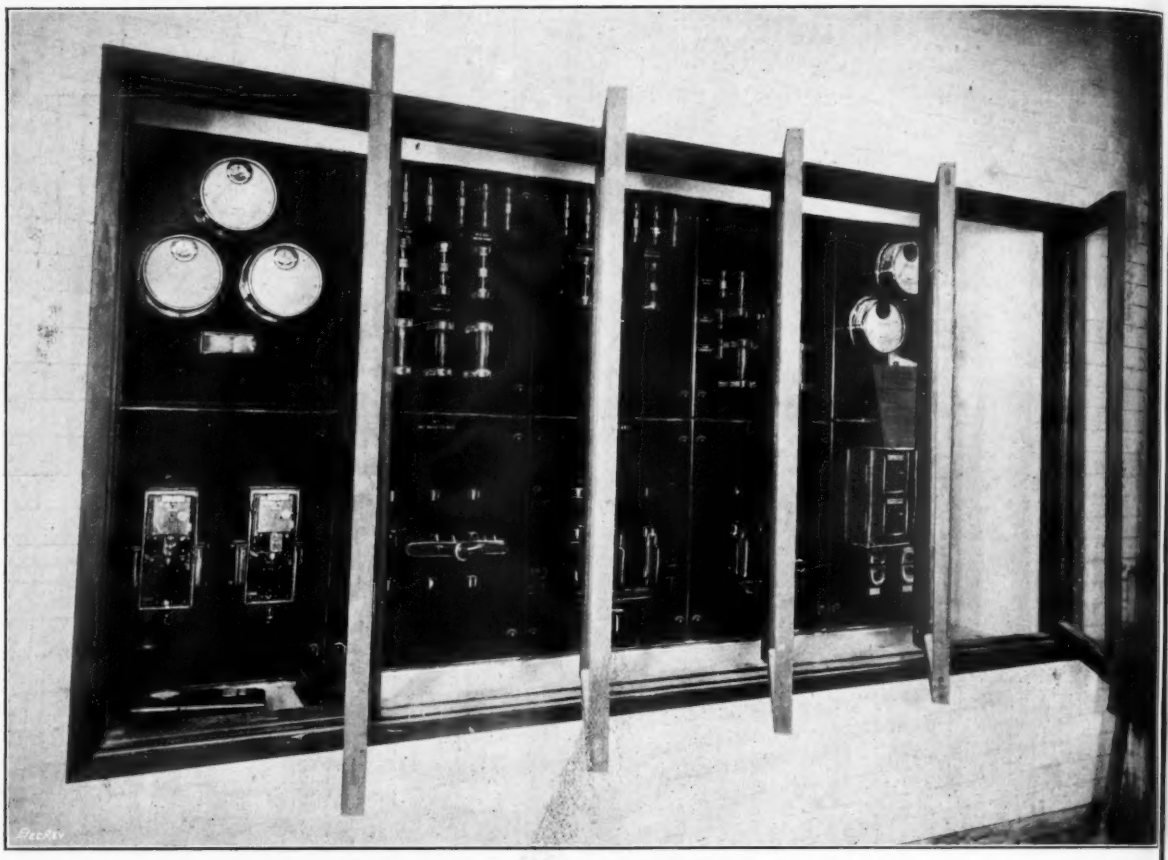


Fig. 12.—Control Board, showing Time Switches and Push Buttons.

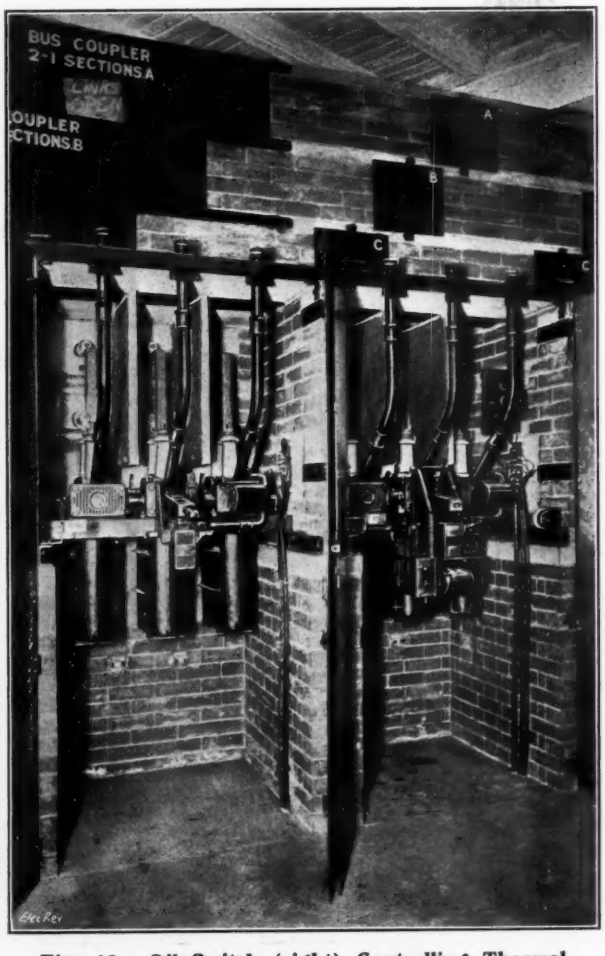


Fig. 13.—Oil Switch (right) Controlling Thermal-Storage Equipment.

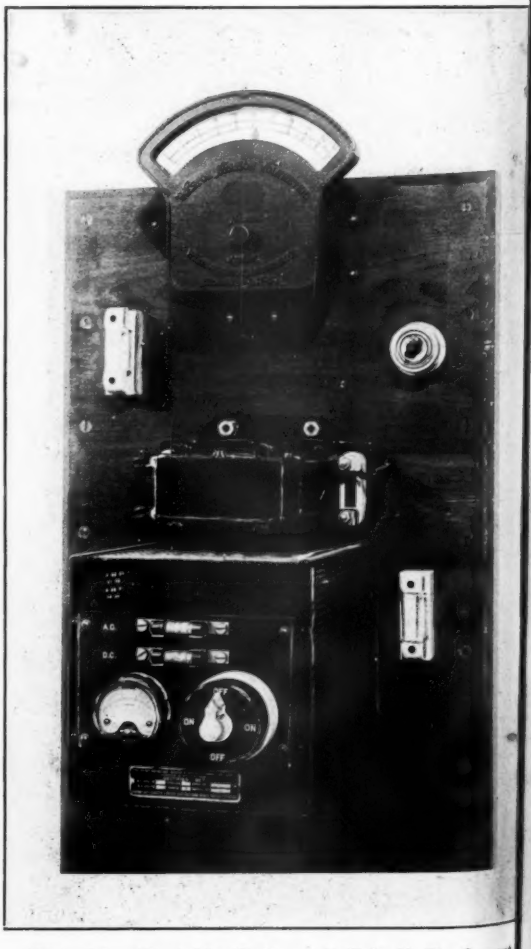


Fig. 14.—Portable Battery "Trip" Equipment.

the head of each heater. Fig. 8 is a view of the head of one of the heaters without the supply connections. The supply is taken directly to the heaters from the secondary terminals of two banks of transformers, one bank for each pair of cylinders, without switchgear of any kind between the transformers and the heaters. Fig. 4 shows the two banks of transformers for the heaters on the left; the smaller bank on the right serves for the general requirements of the premises and a domestic hot-water system to which reference will be made later. The separate larger transformers are each of 255-kVA capacity, and are air-blast cooled, each bank being served by a small motor-driven fan. The transformer equipment was supplied by the English Electric Co., Ltd. The two large banks have no other duty than to supply the heaters for the cylinders of the heating installation. The units in the domestic supply transformer bank are of 140 kVA each.

The entire control for the supply to the heaters is on the h.p. side of the transformers. The actual transformers are positioned in the boiler house, and the oil switches, fig. 13, are contained in a separate chamber.

The equipment in the switch room comprises a 3-phase, 11,000-V bus-bar lay-out and oil switches for controlling the transformers in the boiler room. The e.h.p. bus-bars are supplied at each end by feeders from Charing Cross and Victoria sub-stations, respectively, through 300-A manually-operated oil-switches. The central bus-couplers are normally kept open, each sub-station thus feeding one bank of lighting and one bank of heating transformers, so that failure of supply on either side will only shut down one half the plant, and, by closing the bus-couplers, full supply can be taken from only one sub-station. The lighting oil switches are manually operated, each feeding a bank of three 400-kW air-blast cooled transformers, stepping down from 11,000 to 380 volts; the star-connected secondaries of these supply a 3-phase, 4-wire system for the lighting circuits—380 volts between phases and 220 volts to earth. The 380-volt phase lines feed the heating-water circulating pumps, the air compressors for boiler feed water supply, and two 1,000-gal. boilers for the new building domestic water supply.

The 300-A heater oil switches feed two banks of 750-kW air-blast cooled transformers, the 380-volt star-connected secondaries of which supply the totally immersed tube heating elements of the four boilers for the main water heating installation. These oil switches are motor operated, and normally thermostatically controlled from the boilers, between the variable maximum and minimum temperature limits as already mentioned, but they can also be remote electrically controlled from the boiler room or the switch room, as well as by hand. All the control circuits are supplied by two 220-volt potential transformers from the e.h.p. bus-bars, and the trip circuits by a 30-volt battery charged by a Westinghouse metal rectifier. Full protection is provided by overload and directional relays, operating hand resetting lockout relays. Fig. 14 shows a portable battery outfit which is used for tripping the switches in case of emergency. Thermostat, time switch, and push-button control are provided for the heaters. A thermostat in each cylinder is set so as to open the oil switches when the temperature of the water reaches 300 deg. F., and to close them again when the temperature falls to 130 deg. F. The time switches are arranged so that the h.p. oil switches cannot be closed during the two peak periods. The time switches effect a control over the thermostats in that if the temperature of the water during peak-load periods falls below the lower limit the thermostat cannot function in its designed manner until the time switch again allows the oil switch to close. The push buttons are so arranged as to enable the oil switches to be opened at any time, and also to be closed at any time except when the time switches prevent it, *i.e.*, during the peak-load periods. In addition to the thermostats which control the oil switches, there is also fitted in each cylinder a thermostat which is set slightly higher and is arranged, through the necessary relay apparatus, to ring an alarm bell. As a further safeguard, each cylinder is fitted with a safety valve to prevent a dangerous pressure being reached in the event of steam being generated. Fig. 6 is a close-up view of one of the cylinders, showing the thermostats at the top, the head of one of the heaters, depicting the cable connections, and the alarm equipment on the adjacent pillar. Fig. 12 is a view of the control board in the boiler house, showing the time switches at the bottom left and the push buttons at the bottom right.

Apart from the heating installation, there are also two smaller hot-water cylinders for supplying the domestic requirements. These are of 800 gallons capacity each, and each is fitted with a 35-kW immersion heater. The domestic cylinders are 10 high by 4 ft. in diameter. The control for these heaters is similar to that for the heating installation, but the supply is taken from the general 380-V system for the general supply to the premises. The oil switches governing the heaters are therefore on the 380-V side of the transformers, and are mounted with the time switches actually on the cylinders themselves. Fig. 9 depicts the interesting arrangement of time switches and oil switches in combined units on the walls of the cylinders.

The whole of the storage system, including both the heating and domestic hot-water plants, is lagged with three-inch cork insulation, and it is calculated that if the system were left from mid-day on Saturday until Monday morning filled with water at 300 deg. F., and with the circulating system shut down, the temperature drop of the water would not be more than two or three degrees.

The water is obtained from two artesian wells, 500 ft. deep, sunk under the building, and is brought up to three 1,400-gal. tanks on the basement level by means of compressed air. For this purpose there are two compressors, each of which can be used on either well. These are of the "Sentinel" type supplied by Messrs. Alley & MacLellan, Ltd., and they provide 130 cu. ft. of air at 180 lb. per sq. in. Each compressor is driven by a B.T.-H. induction motor. Fig 3 shows the two motor-driven compressors in the centre

The water from the basement tanks is taken to the roof tanks by high-lift "Sulzer" pumps driven by 8-h.p. motors by Crypto Electrical Co., Ltd. These motors and pumps are controlled automatically by switches operated by floats in the roof tanks. Circulating pumps on the return side of the system serve to maintain the necessary flow of water. These are "Worthington" pumps driven by 9-h.p. B.T.-H. induction motors. They are the two outside equipments shown in fig. 3. Fig. 11 shows the lift motor-driven pumps. The machine on the right is a "sprinkler" pump for the fire-protection apparatus with which the building is equipped.

In conclusion, we are indebted to the London Underground Railways for permission to publish the above particulars and to take photographs, and to Messrs. Richard Crittall & Co., Ltd., for their assistance in the collection of the information.

Increased Consumption with Tariff Reductions.

An analysis of five years' experiences of 40 electricity supply companies in the U.S.A. with regard to the relationship between increased consumption and reduced charges is given in the *Electrical World* of August 30th, 1929. It is stated that over a five-year period one per cent. decrease in charges has resulted in about two per cent. increase in consumption on the average. For tariff reductions exceeding 25 per cent. the increase in consumption is even greater than 50 per cent.

D

The New B.B.C. Station.

A descriptive account of the plant installed at the British Broadcasting Corporation's first regional radio-telephone broadcasting station at Brookmans Park.

SITUATED at Brookmans Park, Herts., about 14 miles north of London, the first of the British Broadcasting Corporation's radio-telephone regional broadcasting stations has commenced to function, tentatively. It radiated its first public test transmission at midnight on September 16-17th on the London station's (2 LO) normal wavelength of 356.3 metres (842 kc), and is intended eventually to take the place of the existing London station and serve the whole of the south-east of England, furnishing two different programmes simultaneously on two wave lengths, for which purpose two aerials and transmitting sets have been installed, as is indicated in fig. 6.

The site of some 34 acres (fig. 1) is exceptionally flat and about 400 ft. above sea level; the building itself occupies about three-quarters of an acre. At the back are two large tanks, each containing some 75 tons of fuel oil for the Diesel engines, and alongside these tanks is the cooling tower for the circulating water for the engines. At the end of the building is a boiler that is capable of heating the whole building by radiators, the heat being derived from the engine exhaust gases; there is also an oil-fired boiler for heating purposes when the engines are not running.

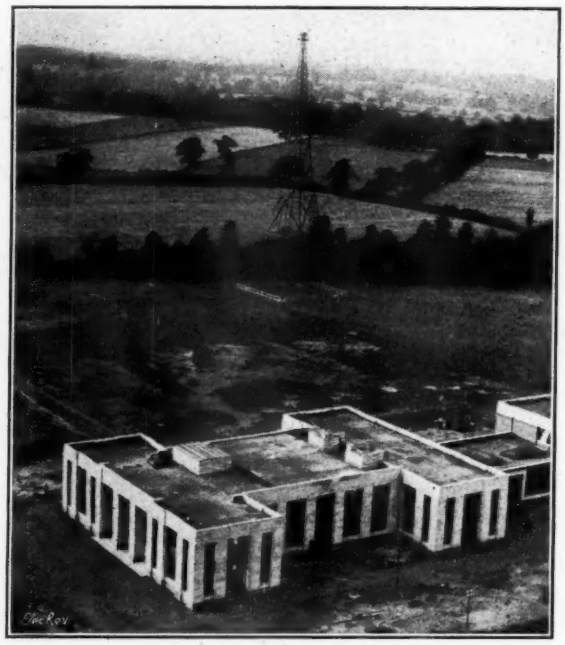


Fig. 1.—Aerial View of Brookmans Park Broadcasting Station.

The power house itself (fig. 2) contains four Diesel engines, each capable of generating some 300 h.p. at 300 r.p.m. They are six-cylinder engines, each coupled direct to a 200-kW 220-volt generator, and all are mounted on a single isolated bed of concrete, which is so constructed that vibration cannot be transmitted to other parts of the building. The power house is on standard lines and is much the same as would be erected for the electricity service in a small town. The supply is direct current at 220 volts in order to make possible the use of a " buffer " battery. The D.P. battery has a capacity of 2,000 ampere-hours and is intended to supply current when the transmitters are not running and when the load is, therefore, very light. It is capable

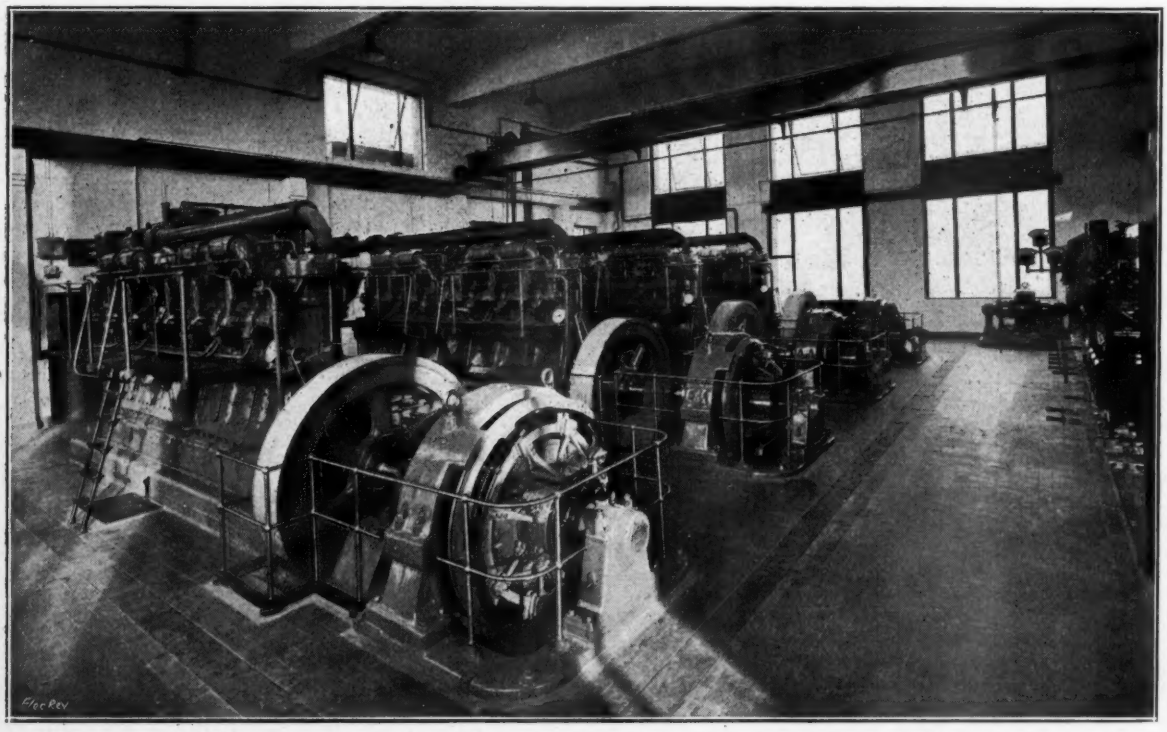


Fig. 2.—General View of the Station's Diesel-electric Power House.

of taking the load of one engine temporarily in the event of a sudden failure.

Adjoining the battery room there is a space for storing spare parts and a workshop, beyond which is the main motor-generator room containing six large sets and a number of small ones. In the centre of the room there are three machines each generating 160 kW at any voltage between 7,000 (20 amperes) and 12,000 (16 amperes) d.c. for energising the anodes of the main transmitting valves. These motor-generator sets each consist of three machines on one bedplate, the 250-h.p., 220-V, 720-r.p.m. driving motor being coupled to two generators, each with two commutators, capable of producing a voltage of 3,000 volts, making 12,000 volts maximum in all. They are probably the most interesting machines in the station: as fig. 3 indicates, the bedplates are not insulated as a protection against induced high voltage, because each armature is completely insulated from the shaft (which is earthed) by a micanite bush. The slot insulation is also micanite, and the efficiency of the sets is 85 per cent. They are surrounded by interlocked railing which prevents access to the machines while the high voltage is being generated.

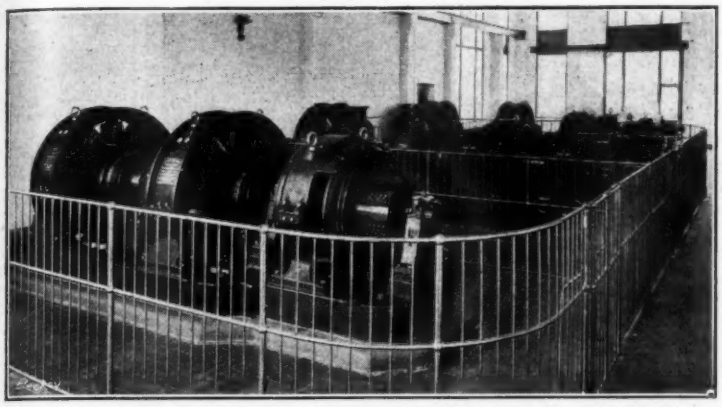


Fig. 3.—D.C. 12,000-V Motor-generators for Valve-anode Supply.

The station is a double one, capable of transmitting two programmes at the same time on two wave-lengths. When the station is running at full load two motor generators will be in use, one for each transmitter, while the third will act as a spare for either transmitter. The other three large machines in this room (fig. 4) are for heating the filaments of the transmitting valves; they are capable of delivering 1,300 amperes at any voltage between 15 and 30. Their arrangement is the same as in the case of the h.p. machines, that is to say, there is one machine for each transmitter and one spare for either. There are a number of small motor generator sets (fig. 5) which supply grid negative voltages and separate anode supplies for the drive and modulated amplifier stages of the transmitters. All these machines are in threes, as in the case of the larger ones.

The largest room is the transmitter hall (fig. 6) which, of course, contains the two transmitters, one along each wall facing each other, while in the background at right angles to the two transmitters is the main switchboard, which controls the output from the machines above described. In the middle of this room are the two control tables, one for each transmitter. Directly underneath each transmitter and the switchboard there is a vault 7 ft. deep, which contains all wiring between the switchboard and the transmitters and various accessories, such as the pumps for the anode-cooling circulating water for the transmitting valves. This wiring was carried out by Messrs. Drake & Gorham, Ltd., and is one of the neatest jobs of its kind we have seen for a long time. There are also two small storage batteries for heating the filaments of the drive valves for which a very steady voltage is necessary to prevent any risk of slight frequency changes.

The transmitters will normally deliver 30 kW to each aerial and employ modulation at low power; briefly, their arrangement is as follows: —

There is first of all a drive stage, in respect of which special precautions are taken to keep the frequency constant to within about 200 cycles. The output from the drive valve is applied to the "separator" stage, after which comes the modulated amplifier, which is the stage at which the modulation takes place, and the power level is approximately ¼ kW. The output from the modulated amplifier operates the first power stage, which consists of two water-cooled valves; the output of this stage operates the final stage, which consists of a maximum of eight valves on either side of a neutrodyned "push-pull" system.

The output circuit is coupled to a feeder system which runs straight out from, and at right angles to, the building and is carried overhead on steel standards to small buildings immediately below the down-lead of each aerial midway between the two masts. These huts contain the aerial transformer apparatus, which, of course, includes the aerial-tuning circuit.

The water-circulating system for the water-cooled valves in the transmitters is of the enclosed type and is arranged in the following way: water is stored in two large closed tanks, situated on the roof of the building, from which it circulates by gravity through the valve-anode jackets to two larger tanks in the vault. It is then pumped through a radiator, over which ordinary mains water is sprayed, and then from the radiator back to the overhead tanks. By using an enclosed system for the valve-cooling water, distilled water can be used instead of hard water, which causes scale to form on the anodes of the valves. The radiator system is external to the building and consists of banks of pipes standing over a concrete cooling pond. All the pumps, &c., for this system are contained in the vault already mentioned, immediately below the transmitters. In this way the wastage of distilled water by evaporation is reduced to a minimum.

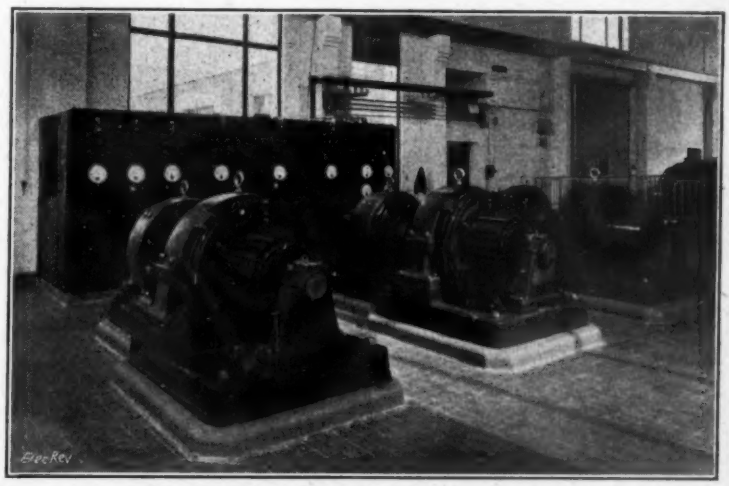


Fig. 4.—Filament-current Motor-generators.

With regard to the mechanical construction of the transmitters, all the units of each complete transmitter are entirely enclosed and screened from each other. Glass panels are provided, with gauze behind them, to allow for inspection while power is on. Safety devices

are provided so that it is impossible to open the doors of any of the units without cutting off the electrical supplies. Apart from precautions against danger to life, the station has intentionally not been designed on so called " fool-proof " principles. It is considered preferable for the engineers at such a station to be sufficiently trained to make " automatic " features undesirable from the point of view of continuity of the service.

Leading out of the main transmitter hall are two control rooms where the programme is received by means of the telephone lines running to Savoy Hill, London. These two rooms, one for each transmitter, contain all the necessary amplifiers, controlling, and monitoring gear. The telephone lines from Savoy Hill have been laid underground all the way to ensure constancy of performance and reliability.

Fig. 5.—Valve Grid-bias Motor-generators.

The front portion of the building is occupied by offices, mess rooms, a kitchen, &c., in addition to two sound-proof listening rooms, one for each transmitter, for quality checking by loud-speaker. There is also a test room for taking precise measurements of the performance of either transmitter, and a small studio for local speech or music tests when necessary.

There are four masts, each two carrying the aerial for one transmitter. The masts are of the self-supporting type, insulated from earth at the base, but they are only 200 ft. high, which is very much lower than would have been chosen from the engineering point of view. Unfortunately, however, there are Government limitations to the height of masts which may be erected in the district and the height became fixed at a low figure for this reason alone. The span between each mast is 600 ft. and there is 900 ft. between the centre line of each aerial. There is a red lantern, electrically lit, at the top of each mast; these lanterns serving to warn aircraft attempting to land in the neighbourhood.

The earth system, which radiates from the aerial transformer houses already mentioned, consists of a number of wires buried one foot below the surface of the ground, the ends of which form an oval extending about 200 ft. to each side of the aerial, and 150 ft. beyond each mast.

The wireless equipment of the station was manufactured by Marconi's Wireless Telegraph Co., Ltd., the valves used being of the "M.O." and "Standard" types.

The Diesel engines, pumps, &c., were supplied by Messrs. Ruston & Hornsby, Ltd.

All the generators, larger motor-generators, motors, switchboards, &c., were made by the English Electric Co., Ltd., while the small motor-generator sets were supplied by Newton Brothers (Derby), Ltd.

In conclusion, it may be recorded that, though negotiations have not yet been completed, it is probable that the site of the northern regional station will be at Pole Moor, Slaithwaite, near Huddersfield. That site satisfies the requirements of the engineers of the Corporation, which has a three months' option to purchase it and is now conducting negotiations with various interests concerned, including farmers, in respect of tenancy rights.

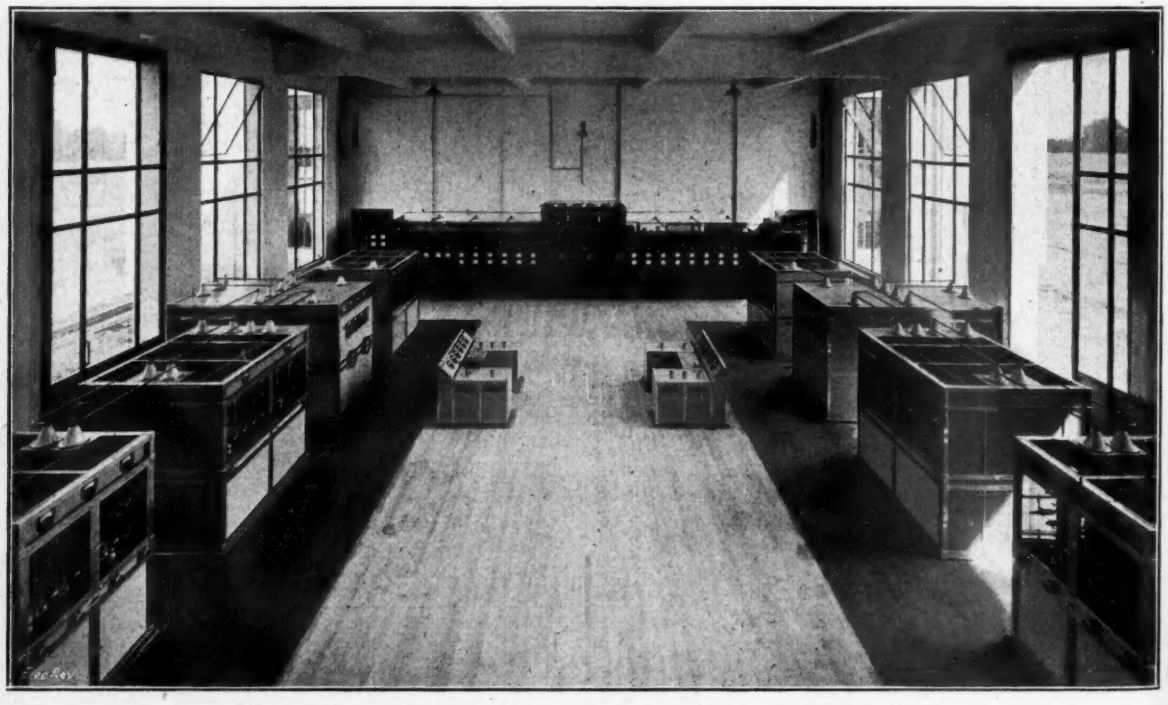


Fig. 6.—General View of Transmitter Hall and Power Switchboard.

In expressing our indebtedness to the British Broadcasting Corporation for the photographs reproduced above, the opportunity must not be missed of congratulating its engineering staff on the design, lay-out, and equipment of what is probably one of the most up-to-date stations of its size and kind.

Television.

An account of a demonstration and an outline of the method of synchronisation employed by the Baird Television Development Co., Ltd.

SINCE we last commented on the progress made by the Baird Television Development Co., Ltd.,* further improvement has been made in detail, so that the results now obtainable are decidedly better than those of a year ago.

Such was the impression gained at a recent demonstration of the company in London, the transmitting and receiving devices being in the same building, but in different rooms. Besides ordinary television (*i.e.*, the reproduction simultaneously of the voice and head of a person talking and singing) photographs, printed matter, &c., is reproducible in the "Televisor" with surprising clarity, and it is now also practicable to transmit "teletalkies," using ordinary standard talking kinematograph films.

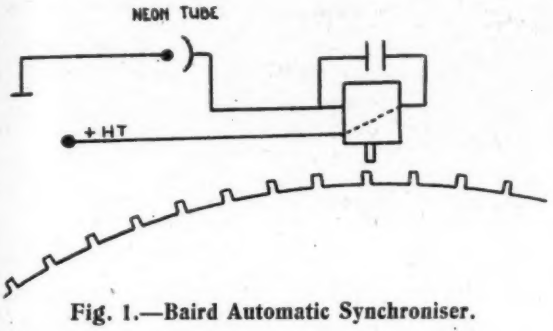


Fig. 1.—Baird Automatic Synchroniser.

Synchronism has long been one of the outstanding problems which has prevented television from becoming a commercial reality. Various methods have been proposed, some of which are extremely complex, expensive, and are only suitable for operation under laboratory conditions, or when an expert staff is available, and are thus quite impractical for use by the general public. Before television can become commercially practicable for broadcasting to the home some form of synchronism must be devised which will not necessitate the use of separate channels of communication and be sufficiently simple and inexpensive to come within the scope of the domestic user. This aim is claimed to have been accomplished by Mr. J. L. Baird, who showed his apparatus in operation during the Radio Exhibition in September, 1928,† and demonstrated it in March, 1929, before a committee of members of Parliament and Post Office and B.B.C. engineers. On those occasions no separate synchronising signal was sent out, the picture being transmitted from a B.B.C. station (2LO) and the speed sent out from a Marconi station on separate wave-lengths, the picture itself providing the synchronising impulses necessary to keep the receiver in step with the transmitter. The means used to accomplish that feat have not hitherto been fully disclosed, for commercial reasons, but in view of the fact that negotiations with the B.B.C. for the broadcasting of television have now been completed and that television is to be broadcast for half-an-hour on five days in the week; and in view, further, of the fact that television receivers manufactured by the Fernseh A.G. (that is, the Baird Company in Germany, the partners being Bosch, Zeiss, Loewe, and Baird) are about to be put on the market in Germany, and "Televisors" will also be put upon the market in England as soon as the broadcasting of television is under way, it is considered that the time has come to publish the following particulars, which were provided by the company.

Synchronising is accomplished by taking from the picture part of the current and using it to keep the mechanism in step. When a large receiving disk is used a commutator directs that current through a relay circuit for a brief interval during each line of the picture; for example, if there are 30 lines in the picture the commutator sends 30 brief impulses through a relay during each reproduction of the image. In operation, the action is as follows:—Between one image and another there is a black division, which is not artificially produced, but is the natural demarcation between one picture and another. When the machines are in synchronism the commutator connects the relay just at that black space; therefore, no current flows through the relay. If, however, the receiver goes slightly faster than the transmitter, the commutator will come into action at a lighted portion of the image and current will pass through the relay, giving an accelerating impulse. The receiving machine is arranged to run very slightly slower than the transmitting machine, so that by means of the relay a balance is achieved.

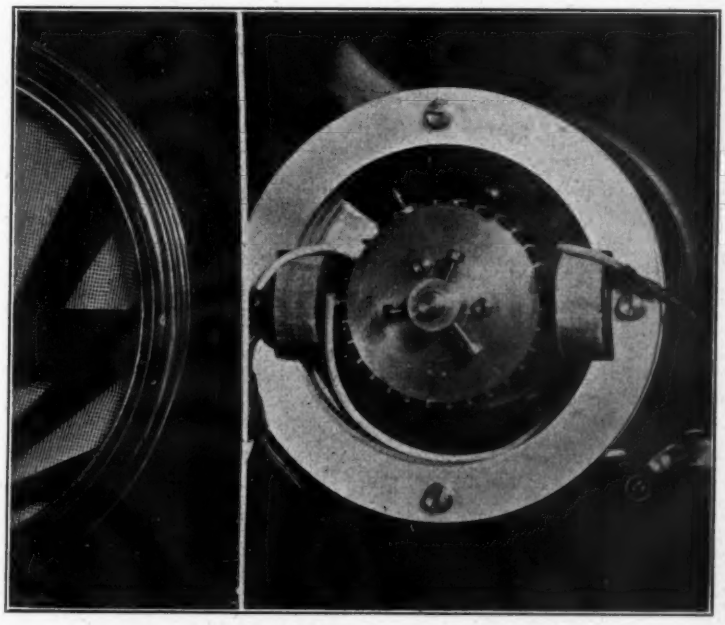


Fig. 2.—"Televisor" Synchronising Device.

The above synchronising mechanism is simplified in the case of the smaller commercial machines to be supplied to the general public. In place of a commutator and relay the correcting signal is applied directly to the coils of an electro-magnet, which acts upon an iron wheel having little teeth corresponding to the interruptions in the commutator (figs. 1 and 2), the neon tube providing the light for the receiver. Thus, when the

* ELEC. REV., October 5th, 1928, p. 547; see also July 20th, 1928, p. 96.

† ELEC. REV., October 5th, 1928, p. 582.

machine runs too slowly the correcting impulse pulls directly upon the iron teeth and accelerates the motor; if it runs too fast it will pull back the teeth and retard the motor. The operation must not be confused with the operation of a phonic wheel, which is a form of synchronous motor driven by alternating current. The cogged wheel is not a driving mechanism, but only functions as a speed corrector.

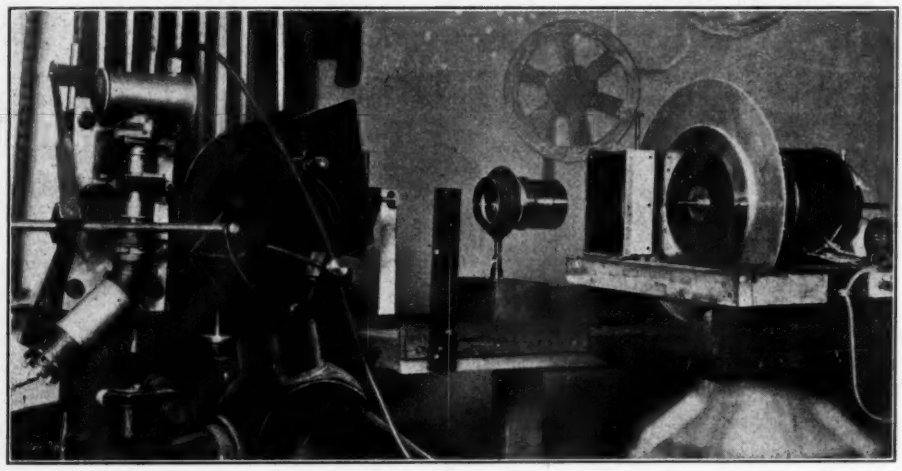


Fig. 3.—Talking Kinematograph Film Projector-transmitter.

Efforts have been made to filter out the line frequency of the picture by means of tuned circuits, and use that to drive a synchronous motor, but this method was found to be complex and impracticable, and necessitated the use of a very broad black bend or white line at the bottom of the picture.

The "Televisor" disk which has been adopted in Germany has 30 holes in it, which was originally the number of holes used by Mr. Baird in 1926, and, strangely enough, the 30-hole disk has proved to be the most efficient, although disks having holes from 90 downwards have been experimented with. With a larger number of holes more detail is obtainable, but as broadcasting restricts one to the use of not more than 10 kilocycles with a corresponding restriction of detail, there is no purpose in providing more holes in the disk than the communication channel can provide detail. The 30-hole disk will be standard in England as on the Continent, and it is being used by the Baird Television Corporation in U.S.A., although other concerns are experimenting with 24 and 48 holes. It is hoped that the 30-hole disk will become standard throughout the world.

The third of the accompanying illustrations shows part of the apparatus used for the television transmission of talking kinematograph films, of the standard Weston Electric Co.'s type with the voice recorded on one edge of the same film as the pictures. The film is passed through the left-hand portion of the apparatus (fig. 3) which deals with the voice record; and also through the projector in the centre, which directs the image on to the 30-hole rotating disk on the right-hand side behind which is the light-sensitive cell. The receiver reproduces the voice and head and shoulders of the person filmed.

Work for the Unemployed.

Assuming careful organisation and direction, the Labour Government's proposals can be expected to ease the present situation and result in valuable and lasting improvement.

By A. W. WILLSMORE.

ONE of the most discussed problems during recent years has been that associated with unemployment. Governments came and Governments went, but the bogey of unemployment, it seemed, was destined to go on for ever. Innumerable attempts at diagnosis were made, but none of the suggested remedies was put to practical test. At last, however, a really serious effort is to be made to deal with the problem, and the Labour Government has already put forward tentative plans.

The Labour plan, which does not differ very much from the Liberal scheme, involves an expenditure of some £75,000,000 on transport developments, land reclamation, and electrification proposals. Under the circumstances, it would not be surprising to find indications in the programme that work is to be given, in certain instances, for the sake of the work itself. Mr. J. H. Thomas, however, has particularly stressed the fact that he is out to give work to the unemployed that will stimulate trade at home and abroad, and add in the end to the economic equipment of the country. This is regarded as a most re-assuring feature by those who were of the opinion that the Labour party's scheme might ignore the implications of the national income theory and treat the problem in a short-sighted manner.

"You can't get more out of a pint pot than you put in it." That is how a young student of economics summed up the dictum of the national income. The doctrine is indeed almost a truism. Obviously, the prosperity of a nation as a whole is determined by the combined production of its members. Without increased output there can be no general amelioration of well-being; and any activities not resulting in a net increase in national wealth do not further the possibility of an improved standard of living. We cannot exist by taking in each other's washing, or, as Mr. Thomas put it recently, by filling barrows and then emptying them again. Similarly, if a young boy smashes a window, his activity may give work to a glazier, but it does not improve the prosperity of the nation as a whole. The efforts of the individuals in a community can be considered as adding to a reservoir, the size of which

measures the possible standard of living. If there is a net increase in production there is consequently a larger national income available for distribution; without an increase in production, devices such as increasing monetary wages, with a view to improving the living conditions of the workers, are futile. An increase in wages, if not accompanied by an increase in production, would be nullified by a rise in price levels.

Socialists argue that the national income should be divided equally among the members of the community. Superficially it certainly seems that a greater combined utility would result from a more equitable distribution and a general levelling up of incomes. Looking beneath the surface, however, the problem is obscured by the probable effect on saving of a socialistic distribution of national wealth; while the fact that wholesale "nationalisation" would be necessary to put the scheme into practice entails the obvious dangers of bureaucracy. socialism might be possible in a self-supporting community, but its adoption by a nation dependent for its existence on trade with the rest of the world, would, in effect, be racial suicide.

Ignoring, then, the fatal temptations of socialism, the prosperity of the country can be advanced only by an increase in net production. Happily, it seems that the members of the Labour party, or at least the responsible leaders of the party, appreciate the force of this economic argument, and the recently announced programme, while carefully avoiding the wider socialistic projects mooted before the party was put into office, displays a genuine attempt to tackle the unemployment problem in an orthodox and practical manner.

At the present day, apart from the idle rich, there are about a million able-bodied workmen who are being maintained by the activities of their fellow-workers without themselves contributing to the national income. It will be obvious that, apart from the effect on their morale, if these unemployed were producing something of value instead of standing idle, the total income available for distribution all round would be correspondingly increased, and the standard of living improved proportionately. The key to increased prosperity is therefore tied to the problem of finding work for these unemployed.

Under present economic conditions, production is dependent upon demand. Manufacturers put work in hand in accordance with their estimate of the size of the present and future market for their goods. When they anticipate a falling off in demand they restrict their output; and only when they feel reasonably confident that an expanding market can absorb their products do they increase production. But in the aggregate, the demand for their goods is itself a function of the amount they produce. Unless industrial production on the whole is increased, real wages cannot be raised; and, until real wages are improved, the workers cannot increase their effective demand for the products of industry. The result is a dead end. Manufacturers, as a body, will not increase their production and sign on more men until demand shows signs of improvement; and normal demand cannot increase until the manufacturers do take on more workers.

Innumerable attempts have been made to find a way out of the tangle. Outwardly, the suggested schemes are quite different, but, fundamentally, they are identical in that they all aim at providing an artificial stimulus to demand. The Labour Government proposes to achieve this object by expending some £75,000,000 on public works.

It is expected that the transport and other developments will themselves absorb a large body of the floating unemployed, and increased requirements for raw materials from ancillary industries will also put more men in work. The net result should be that the purchasing power of the community as a whole will receive an artificial boost measured by the amount of capital expenditure on the new works. This boost will be reflected in increased purchasing power among the working classes as a whole, and manufacturers not directly associated with the public works developments will increase the number of their employés to meet the increased demand. It is expected that the latter development will lead to a general expansion in industry, which will counterbalance the falling off in employment as the transport development schemes near completion; so that by the end of the period of artificial prosperity in the public works construction industry, trade itself will have experienced a normal expansion, sufficient to absorb the bulk of the unemployed. In addition, the valuable assets resulting from the capital expenditure will prove a real benefit to the nation as a whole.

The success or otherwise of the scheme will be determined by the extent of the normal improvement in industry arising out of the artificial boom in the public works construction section. The mere spending of money will not solve the unemployment problem; indeed, if it involves a shortage of working capital in industry as a whole, it will negative from the outset the object it sets out to achieve.

Moreover, the argument presupposes that the financing of the scheme will not reduce the purchasing power of the public in other directions. Considerable attention must be paid to this point if the scheme is to prove a success, since it undoubtedly contains latent possibilities in this direction for creating as much harm as it expects to achieve good. It may be of interest, therefore, to touch on one or two suggestions that have recently been advanced to treat the problem on an entirely different footing.

Perhaps the most interesting suggestion is that put forward by the proponents of the hire-purchase system of trading. Their argument is that the extension of the hire-purchase system would enable the public to increase its effective demand, inasmuch as the individual members would be in a position to purchase articles hitherto beyond their means. This artificial stimulus to demand would, it is asserted, bring about increased production in many industries and thus reduce unemployment. The system, we are told, would have a snowball effect, and, to the objection that the increase in production would be mainly in the luxury trades, it is pointed out that an improved standard of living in this country must mean increased consumption of luxuries.

On the face of it, this would seem an ideal solution to the problem of increasing normal demand, and undoubtedly the present prosperity in the U.S.A. is not unconnected with the growth there of instalment selling. In Great Britain, however, it seems that the system implies merely a transfer of demand from one type of article to another, and has not led to a real increase in the purchasing power of the public. If this object was to be reached, it would be necessary for a man to buy beyond his means to-day in the knowledge that everybody else was doing the same, and that they all would both be obliged to, and be able to, do more work to-morrow to pay their bills. This point of view would scarcely commend itself to the British worker, and great though its advantages may be in other directions, the hire-purchase system does not appeal to the writer as a solution to the present difficulty.

Another suggestion, this from an American source, is to reduce the length of the normal working day without reducing wages. It is argued that, if the solution to the difficulty lies primarily on the side of consumption, then you must give the workers more leisure and more spare time in which to consume. Do this, we are told, and there will result an increase in demand. We have seen, however, that there can be no increase in real wages (*i.e.*, effective demand) without increased production, and the reduction of working hours does not commend itself as a practical means of achieving this object. There is a certain amount of truth in the argument, but its adoption demands as a prerequisite an already high standard of living with heavy consumption of luxuries, and industry organised on mass production lines.

On the whole, it seems that proposals of the type put forward by the Labour party are best suited to meet the present difficulty, and given careful handling it is not over optimistic to expect a valuable and lasting improvement to result from their adoption.

A High-Pressure Station.

An outline of the plant lay-out in a new generating station in Germany.

By C. H. S. TUPHOLME.

A NEW electricity generating station has been put into operation at Mannheim-Rheinau, Germany, with boilers working at 1,450 lb. per sq. in. pressure. With two high-pressure boilers, each evaporating 60 tons of water per hour, the capacity of the station has been considerably increased by the installation of primary regenerative turbines of 7,000 kW and 4,500 kW, a back-pressure turbine of 4,500 kW for 1,450-264 lb., and a regenerative primary engine of 700 kW.

The boilers are fed by four super-high-pressure Sulzer pumps, each delivering 90 tons per hour, two of them directly-coupled to steam turbines working with steam at 255 lb., and two driven through toothed speed-increasing gearing by three-phase motors.

The diagram (fig. 1) shows the layout of the plant. The steam pressure falls from 1,450 to 264 lb. in the primary turbines V, and then passes through intermediate superheaters Z to the main turbines H, which work with condensation.

In feeding the boilers of the new plant, the advantages

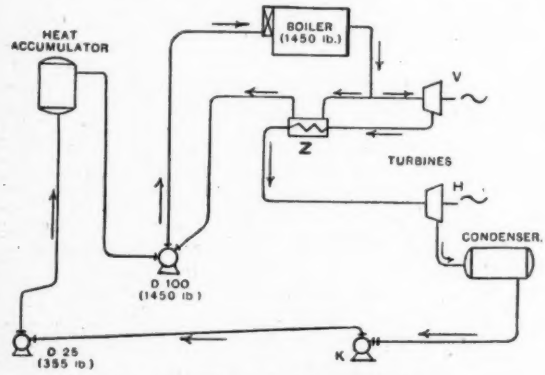


Fig. 1.—Plant Lay-out Diagram.

offered by a high feed-water temperature have been made use of. Four Sulzer four-stage high-lift centrifugal pumps, each delivering 125 tons per hour against a total head of 335 lb., are driven by directly-coupled 180-h.p. three-phase motors running at 2,900 r.p.m.

The condensate is withdrawn from the condenser by a two-stage pump K, which is combined in one pumping set with the cooling water and injection water pumps. The condensate, together with the quantity of make-up feed-water required, is then led at a temperature of about 80 deg. C., to the intermediate pumps D25, which deliver the water into a system of constant-pressure heat accumulators, where its temperature is raised almost to the evaporating point. From there the water flows at a temperature of about 200 deg. C. and under a pressure of 260 lb. to the nine-stage super-high-pressure feed pumps D100. Each of these pumps delivers normally 90 tons per hour and increases the pressure by 1,325 lb., so that the pressure at the end of the ninth stage reaches 1,590 lb.; at that pressure the water is passed through the economisers into the boilers, which work at a pressure of 1,450 lb.

In the intermediate superheater Z the exhaust steam from the turbines V, which issues at a pressure of 264 lb. and a temperature of 250 deg. C., has to be raised to a higher degree of superheat (about 340 deg. C.) before it enters the main turbines. For that purpose live steam at a pressure of 1,450 lb. and a temperature of 460 deg. C. is passed through the superheater, along the outside of the tubes carrying the steam at 264 lb. In consequence of the heat exchange, the temperature of the steam used for heating falls below the critical point and water of condensation is produced at a temperature of from 298 to 306 deg. C., corresponding to a saturation pressure of 1,335 lb. This water has to be led back to the boilers, and for this purpose it is introduced through an auxiliary branch into the super-high-pressure boiler-feed pumps, which it enters at a pressure of 1,170 lb. gauge and a temperature of 297 deg. C. To reduce the fall in pressure to the minimum, this branch is fitted between the sixth and seventh stages of the pump.

Reviews.

Transformer Construction and Operation. By E. G. Reed. First edition. Pp. xii+277; fig. 129. London: McGraw Hill Publishing Co., Ltd. Price 15s. net.

The present volume is in part complementary to the author's earlier work on "The Essentials of Transformer Practice" (see the ELECTRICAL REVIEW for December 28th, 1928), and in part is a summary of some of the matter contained in that book. The volume aims at presenting a comprehensive outline of present-day transformer prices in the U.S.A., and this has been accomplished fairly effectively, certainly without the introduction of superfluous matter. In fact, if we may be permitted a slight criticism at this early stage, we should feel inclined to say that the value of the volume would have been enhanced considerably by the inclusion of more detail within so attractive an outline. However, this may be a matter of opinion between authors.

Chapter I is a short introduction to the subject, and describes very briefly the function and method of working of the transformer. Chapter II is a brief historical sketch of transformer development in the U.S.A. from the early Gaulard and Gibbs transformer of 1885-6 to those of present-day construction. The author indicates the broad lines upon which developments have taken place in respect of quality and form of the core plates, insulating oil, and types of tanks. Two recent landmarks in American transformer history were the appearance of the oil expansion tank in 1920 and the development of the "inertaire" transformer about 1923. It is interesting to note how the progress of transformer design was delayed at 50 to 60 kV by the fact that these pressures then represented the limit of pin type insulator design. The subsequent introduction of suspension-type insulators, however, removed the limitation, and permitted transformer designs to progress to higher voltages.

Chapter III deals briefly with the classification of transformers with regard to service and installation requirements. In the former group are included instrument, street lighting, distribution, sub-station, and transmission transformers, while the second class covers transformers mounted on switchboards, indoors, outdoors, and in manhole chambers. The chapter indicates the types of transformers which are generally encountered under these classifications.

Chapter IV is concerned with the main items characterising transformer ratings, namely, phase, capacity, voltage, and frequency. The first of these discusses the question of single *versus* three-phase transformers, and certain conclusions are drawn which are only applicable to the U.S.A., where single-phase transformers have been more highly developed. Tables are given of American standard voltage and kVA ratings for single and three-phase transformers. Forms of construction for power and distribution transformers are described in Chapter V, which illustrates various forms of shell and core-type transformers. The author very rightly points out that the shell and core types of transformers each have their own field of application, and this is a fact which is frequently overlooked in discussions on the subject. After outlining the relation between shell and core type transformers, the author passes on to consider the selection of the form of construction for distribution and for power transformers. The next two chapters, namely VI and VII, describe the magnetic circuit and the current circuit respectively. The former of these illustrates the various forms of construction of the magnetic circuit, together with the influence of surrounding metal structure on the operation of the magnetic circuit. The author also indicates the general characteristics of the high silicon content alloy sheet steel which is now commonly used for transformer cores, and the chapter is concluded by considerations of the exciting current, iron loss, and the variation of iron loss and exciting current with frequency and voltage. The chapter on the current circuit discusses the general characteristics of copper conductors and the types of windings for shell and core type transformers, both for distribution and power transformers. The chapter concludes with brief surveys of the broad principles of magnetic leakage, copper loss, reactive voltage and regulation. Chapter VIII is concerned with the descriptions of the various methods which are used for cooling transformers. These are given for naturally and artificially cooled transformers of the oil-immersed and air-insulated types. The author discusses the fields of application of tanks having smooth and corrugated surfaces, tubular tanks, and tanks fitted with external detachable radiators, for artificial cooling, transformers designed for water cooling, forced

oil cooling, and, finally, those provided with auxiliary air blast on radiating surfaces and air blast through the core and coils. Chapter IX describes, rather shortly, the mechanical features of tanks and magnetic circuit end frames with special reference, in the latter case, to rectangular shell type transformers. The important subjects of insulation and bushings are dealt with in Chapter X, the materials used for the purpose being grouped under headings of inorganic materials, organic materials, and impregnating compounds. The author indicates the various insulating materials under the different groups which are available for transformer construction. Bushings are grouped under the headings of bushings for insulated cables, bushings for lead covered cables, and bushings with lead terminating at the end of the bushing. In the first case plain porcelain bushings fulfil all the requirements. In the second case some form of cable box or wiping gland is used. In the third case plain porcelain bushings are used for the lower voltage terminals and condenser type bushings for high voltage units. The author describes the general form of construction of condenser bushings in which each condenser layer corresponds approximately to 4 kV of line voltage.

Chapter XI discusses heating and temperature control, and is concerned with the measurement of both oil and winding temperatures. In this connection the author states that the only way in which the temperature inside a transformer coil can be measured is by the use of thermo-couples or of a resistance coil buried in the transformer winding as it is being constructed. With this we are in agreement, and it should be noted that other types of so-called hottest spot indicators based upon current comparisons do not afford a definite knowledge of internal temperatures, but only, as the author says elsewhere, " an indication of the temperature of the transformer winding." The chapter includes references to thermometer type and bridge type hottest spot indicators, and to the so-called thermal indicator. An outline of the factors involved in evaluating the cost of losses and regulation is given in Chapter XII, which embraces considerations of investment charge, cost of energy, cost of iron loss, copper loss, exciting current and regulation, and minimum cost of operation. Chapter XIII deals with the mechanical stresses which are developed in transformer windings of different shapes and arrangements under the influence of short circuit currents. Oil and its conservation is the subject of Chapter XIV, which discloses the reasons for the use of oil in transformers and proceeds to indicate the kinds available. Sludging action and the decomposition of oil are briefly referred to. Service conditions as affecting the condition of the oil and of possibly contaminated winding surfaces are next dealt with and methods of oil reconditioning are described. The chapter concludes with descriptions of the " inertaire " equipment, which has been developed in the U.S.A., and of the use of the expansion chamber, which is now general throughout the world. In Chapter XV various forms of no-load and on-load tap changers are described in principle and construction. The broad principles of single and polyphase transformer connections are described and illustrated in Chapter XVI, both for voltage and phase transformation. This involves a consideration of various combinations of primary and secondary connections for three- and six-phase transformers. The theory underlying the production of harmonic e.m.f.'s and currents is given in Chapter XVII, and special attention is directed to the influence of three-phase transformer connections upon harmonics. It is shown why third harmonic voltages in particular are objectionable and how these can be suppressed. It is also shown how harmonic currents are produced and why the third harmonic current is objectionable. In an all too brief chapter the author refers to three winding transformers for which there has been a demand during recent years. The chief uses for these are for high voltage network service, for supplying synchronous condensers for connection to transmission lines, and for tertiary windings. The chapter describes the spheres of application of transformers for these conditions.

Auto-transformers are dealt with in Chapter XIX, which covers theory of operation, output, rating, impedance, and changing of tappings. Chapter XX indicates the application of auto-transformers and covers those for motor starting, power service, and for certain stated miscellaneous uses. Chapter XXI is concerned with the fundamental laws governing parallel operation, the subject being extended in Chapter XXII to cover the group operation of transformers. Chapter XXIII describes the tests necessary for transformer operative conditions, insulation tests, and performance acceptance tests. Chapters XXIV and XXV deal with the uses, application, fundamental relations, limitations in application and design, and the general types of current limiting reactors which are now in common use. The book is provided with the usual list of chapter contents and with a serviceable index.

The volume will be of particular value to technical students who have yet to gain their practical experience, as it provides a very excellent, though sometimes all too brief, survey of the general field of transformer construction. Moreover, the senior engineer whose duties confine him to other fields cannot fail to derive considerable assistance from the work.

We hope the present work is an indication that Mr. Reed is proceeding with the multi-volume symposium suggested in the ELECTRICAL REVIEW of December 28th, 1928.

The volume is produced in the usual McGraw Hill style than which nothing more need be said.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A New Electric Fire Element.

MESSRS. WILLIAM GEIPEL, LTD., Vulcan Works, 156-170, Bermondsey Street, S.E.1, have perfected and will shortly put on the market a new electric fire element for use with their standard range of " Quead " electric fires. The new element, fig. 1, is of the flat-bar type, the heater spirals being disposed horizontally in deep grooves. Bridges are formed in the fireclay at intervals for the purpose of holding the spirals in position, eliminating the practice of anchoring the spirals with wires at various points. The bridges also form cross supports to the walls of the grooves and greatly add to the mechanical

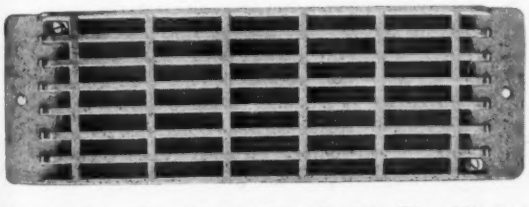


Fig. 1.—The New " Quead " Electric Fire Element.

strength of the element. Barriers are provided at the ends of the grooves to prevent undue elongation of the spirals when in use. The element will safely withstand the standard tests that Messrs. Geipel apply to all their elements, namely: (1) the element is heated up at full load until the fireclay former attains its maximum heat; (2) the element is then quenched out in cold water; (3) it is then re-heated whilst still dripping wet. Under this test the fireclay does not fracture. It is proposed to load the new element at 1 kW or 1½ kW to suit customers' requirements. The new element will henceforth be fitted as standard to the following " Quead " electric fires: Models Q 90, Q 130, Q 9, Q 10, Q 12, Q 13 and Q 14.

Improved Ceiling Fans.

There are certain difficulties in the design and manufacture of ceiling fans which do not manifest themselves in the wall-pattern or pedestal types. Ceiling fans must be capable of long runs without attention, must be noiseless and free from the very objectionable fault of oil leakage, with its resultant damage to clothing and furniture. It was to overcome these

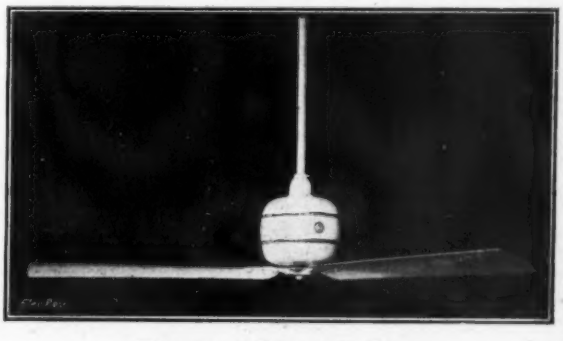


Fig. 2.—" Prescot " Fan.

difficulties that British Insulated Cables, Ltd., Prescot, Lancs., produced for the Indian market a specially designed ceiling fan free from the defects known to be present in fans existing at that time. It was realised that one of the chief troubles with open-type fans was the cost of maintenance as well as their low efficiency. The lubricating oil became thick, due to the ingress of dust, insects, &c., and required fairly frequent attention to keep the fan in good running order. With the thicken-

ing of the lubricant the friction of the rotating parts increased, and the consequent rise of current in turn caused increased heating and bad commutation. This affected the brushes and commutator till general deterioration set in. To reduce these troubles to a minimum, it was necessary to make a fan with a totally enclosed motor, incorporating a self-contained oiling system. This in turn necessitated special care in the design of the internal parts, so that overheating could not take place at any point, ventilation being ruled out for the reasons already given. To obtain absolute security against oil creepage a patented means of supporting a revolving armature upon a foot step bearing surmounting the oil vessel was employed. By this means the oil is self-contained in the reservoir and circulates through the centre of the fixed spindle and between the bottom of the oil vessel and the suspension ring. As the fan is totally enclosed no dust can become mixed with the oil, and as there is no leakage the oil level never alters, so that the fan will run for several years without any attention. The commutator and brushes are placed at the bottom of the fan away from the oil vessel, and it is not possible for carbon dust to enter the oil chamber. The fans are finished in black and silver or white and gold. The regulator is of neat design and has studs and an "off position." An illustration of the fan appears in fig. 2, page 481.

The following tests carried out by the National Physical Laboratory, confirm the high efficiency which the makers claim:—

"PRESCOT" FAN No. 9437.

Number of blades	3
Sweep of blades	62½ in.
Watts input	82.1
Voltage	220 d.c.
Current	0.373 A.
Speed	175 r.p.m.
Equivalent watts output at motor spindle	45.5
Commercial efficiency of motor	54 per cent.
Temperature of air when air delivery was ascertained	64.2 deg. F.
Quantity of air delivered by fan per minute (Readings taken six feet below fan blades).	22,700 cu. ft.
Calculated rise in temperature in motor windings above air temperature	31.2 deg. F.

There are situations where the Prescot standard fans move too much air, and the "Prescot Junior" has been designed to meet this requirement. While lower in price than the standard model, a high degree of efficiency is still maintained. This fan also is totally enclosed, and is constructed on the Lundell field principle. The lubricating chambers are constructed so that it is impossible for oil to leak. The speed of this fan is necessarily higher.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The Trade Commissioner Service.

The Department of Overseas Trade announces that the Sydney Trade Commissioner post is being filled by the appointment of Mr. F. W. Colman, Chief Clerk in the office of the Trade Commissioner, Sydney.

Mr. T. M. Ainscough, C.B.E., Senior Trade Commissioner in India, is now on an official visit to this country. He can be interviewed by appointment at the D.O.T. Offices, 35, Old Queen Street, S.W.1, between September 25th and October 11th.

The Bakers' Exhibition.

Last week, from September 7th to 13th, the Confectioners' Bakers', and Allied Traders' 33rd International Exhibition and Market was held. From the electrical point of view, a feature was the increased use of built-in motors for driving the various bakehouse machinery, and a large variety of such equipment was displayed by many exhibitors.

The General Electric Co., Ltd., showed one of its double-deck, drawplate-type electric ovens, the elements of which are contained in steam-tight tubes running the whole length of the interior of the oven. The top row of the elements is controlled by a switch on a panel fixed at the side, which allows for full, half, and quarter heat. Another switch is provided, controlling in a similar manner the elements below the tiled sole.

A two-deck electric oven was also exhibited by the Artofex Engineering Works, Ltd. The elements in this oven are located and graded to give uniformity of baking, and are so devised that they spread over the entire oven crown and under the whole oven sole giving high efficiency. Self-generating steam apparatus is included as part of the equipment. An interesting item of this company's exhibits was the use of an ultra-violet ray lamp when making the bread. It is claimed that this process imparts more vitamins "D" than would otherwise be contained in the bread, and also improves the bloom.

In addition to its familiar dish washers, potato peelers, mincers, &c., the Peerless Electrical Manufacturing Co., Ltd., exhibited a cake mixer, one of the chief features of which is the single lever control, which obviates the necessity of switching off to change gear.

Among other exhibitors of electrical equipment may be mentioned Messrs. Baker, Perkins, Ltd., and David Thomson, Ltd. (electric ovens); Barron's (Leicester), Ltd. (ovens and electrical machinery); Frigidaire, Ltd. (electrical refrigerators); Hobart Manufacturing Co., Ltd. (food-preparing machines); Milkanic Emulsors, Ltd. (machinery for emulsing butter and milk powder into cream); Read's Mixers and Oven Co., Ltd.; Mr. H. C. Slingsby (electric vehicles and trucks); and the Attracta Electrical Co. (electric signs).

Registered Electrical Contractors.

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Pounder, John, Ltd., West Hartlepool.
Martin, J. E., & Son, Leeds.
Taylor, G., & Co., West Gorton, Manchester.
Rayton, T., Leeds.
McCrudden, J., & Son, Belfast.
Fairey & Goodenough, Castleford.
Wrigley, J. R., Southport.
Johnson & Dare, Handsworth, Birmingham.
Smith, H., Wakefield.
Brampton, P. J., Blackpool.
Alderson & Beaty, Darlington.
Friend & Horton, Exeter.
Elvins, J., Sparkbrook, Birmingham.
Wallis, G. E., & Sons, Ltd., Ashford, Kent.
Estall, H., Kensington Square, W.8.
Shepperson & Dooley, Archway Road, N.6.
Lummus, T. F., Chichester.
Porter, W. T., & Co., Bristol.
Main, E. V., & Co., Mill Hill, N.W.7.
Jackson, A., & Co., Liverpool.

The E.T.B.I. Competition.

The Cable Competition organised by the Electrical Trades Benevolent Institution closes on September 30th, and all money, counterfoils, unsold tickets and solutions, should be forwarded by that date to the secretary, Capt. J. T. Keeping, M.C., 9, Southampton Row, W.C.1.

The Electrical Trades Union.

The 38th annual report of the E.T.U., covering the year ended December 31st, 1928, states that the union will be 40 years old next year and its history is reviewed, mention being made of the serious effect of the General Strike upon membership and finances. Although 1928 was a difficult year a great deal of lost ground was recovered; the membership increased and the financial position improved. The number of members rose by 475 to 26,187, and the amount of general funds increased from £7,208 to £15,577 (excluding the political fund). It is stated that the interweaving of mechanical and electrical

engineering makes it difficult for the union to secure improved wages and conditions for its members. Reference is made to the good relations subsisting between the E.T.U. and the National Federated Electrical Association. As regards the electricity supply industry, a successful effort was made to secure that compensation should be paid to members displaced by the closing down of redundant or obsolete stations. Negotiations are still in progress for a special advance for the higher power station grades, such as switchboard engineers and substation attendants and their assistants.

Bankruptcy Proceedings.

R. K. HILTON, 81, Blackburn Street, Radcliffe, Lancs., electrical engineer.—This debtor's application for discharge was heard on September 11th at the Court House, Bolton. The receiving order was made in 1928 and, according to the statement of affairs, there were liabilities amounting to £479. against assets of £198. Debtor stated that his losses were due to undertaking unprofitable structural alterations to premises. The discharge was granted subject to a suspension of six months.

A. E. SHAPLAND, electrical engineer, 13a, High Street, Budleigh Salterton.—Receiving order made September 6th on debtor's own petition.

H. H. D. RADCLIFFE & F. HADDLETON (City Electric Services), electrical engineers, 51, Islington Row, Birmingham.—Last day for proofs for dividend September 25th. Trustee, Mr. C. Hoult, Official Receiver, 191, Corporation Street, Birmingham.

J. R. CHARNOCK, electrical engineer, &c., top of Meanwood Road, Meanwood, Leeds.—Supplemental dividend of 1s. 2d. in the £ payable September 26th at the Official Receiver's office, 24, Lower Bond Street, Leeds.

Company Liquidations.

STEVENS & COLE, LTD., wireless goods dealers, 46, Barking Road, Canning Town, E.—The first meeting of the creditors and shareholders of this company were held on September 10th at the Board of Trade Offices, Carey Street, W.C., before Mr. H. P. Naunton, Official Receiver. A statement was submitted showing liabilities of £2,497 against assets of £904, and a deficiency of £1,743 with regard to contributories, the issued capital being £150. The chairman reported that the company was formed in June, 1928, to carry on the business of dealers in wireless equipment, gramophones, &c., the managing director being Mr. Leonard Cole. It originally had two shops at East India Dock Road and Barking Road, where Mr. Cole had been trading under the style of Stevens & Cole, but the former branch was given up in 1928. Early in March last the company opened another branch in Barking Road and the premises were burgled shortly afterwards, stock to the value of £100 being taken, and as it was not insured the amount was a total loss. Through lack of cash to meet the demands of pressing creditors, Mr. Cole in April advanced £150 to the company on the security of a debenture for that amount. Mr. Harris Rainsbury was appointed receiver on June 25th; he carried on the business for a time and then sold the balance of the stock and effects at 46, Barking Road, for £220. The only other asset of importance was the lease of 284, Barking Road; an offer of £450 was made for it last May, but owing to illness on the part of the purchaser it was not proceeded with, and it was doubtful whether the lease would now fetch anything like that sum. The failure of the company was attributed to severe trade competition, depreciation in the value of stock, and lack of experience on the part of the directors. The liquidation was left in the hands of the Official Receiver.

PERRING-THOMS WIRELESS SYNDICATE, LTD.—Particulars of claims by October 21st to the liquidator, Mr. A. Williams, 82, Queen's Road, Brighton.

OCO ELECTRICAL APPLIANCES, LTD.—A meeting of members is called for October 11th at 16, John Dalton Street, Manchester, to hear an account of the winding up from the liquidator, Mr. C. D. Britten.

Private Arrangements.

E. PARCELL, wireless and electrical fittings dealer, Eastcheap, Letchworth.—A meeting of creditors was held on September 11th at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., when Mr. W. A. J. Osborne submitted a statement of affairs which showed ranking liabilities of £563 and net assets of £471, leaving a deficiency of £92. Mr. Osborne stated that the debtor had been carrying on business for a number of years. About two years ago the creditors were consulted, and they agreed to accept 10s. in the £ in four equal instalments, and that composition had been paid. In 1927 there was a surplus, as a going concern, of £79, but it was then estimated that if a realisation took place there would be a deficiency of £241. The position had improved since 1927, due to the fact that the old liabilities had been discharged by the payment of 10s. in the £. During recent months attempts had been made to sell the business as a going concern. It was understood that there was a syndicate which was prepared to buy a large number of small retailers' shops in the wireless and electrical trade in different parts of the country. Efforts had been made to get in touch with that syndicate, but nothing definite had been done. The debtor thought he could carry on the business profitably, but Mr. Osborne said that unless the turnover could be increased, he did not see how the concern could be made a success. It was decided that a deed of assignment should be executed with Mr. W. A. J. Osborne as trustee. The following are creditors:—

	£		£
J. J. Eastick & Sons	298	C. B. Dickeson & Sons, Ltd.	38
A. C. Cossor, Ltd.	41	Pritchett & Gold and E.P.S. Co., Ltd.	26
Corfield & Cripwell	54		
Philips Lamps, Ltd.	24		

Dissolution of Partnership.

MEREDITH & SIMS, automobile electrical engineers, Stanley Street, Rotherham.—Mr. I. L. Meredith and J. Simms have dissolved partnership. Mr. Simms will attend to debts.

Trade Announcements.

The telephone numbers of the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., have been altered to Temple Bar 7058 and 7059.

The RELAY AUTOMATIC TELEPHONE COMPANY's telephone number at Marconi House has been changed to Temple Bar 1117.

The telephone number of A-S REFRIGERATING MACHINES, LTD., Magnet House, Kingsway, W.C.2, is now Temple Bar 8000.

The telephone number of the RELIANCE TELEPHONE CO., LTD., Goschen Buildings, Henrietta Street, W.C.2., has been changed from Regent 1010 to Temple Bar 1010 (4 lines).

Mr. A. J. CUNNINGHAM has commenced business on his own account, trading as Cunningham, Beard & Co., at 146, Kensington High Street, W.8, as electrical and radio engineer, and manufacturer of decorative fittings for kinemas. He asks for manufacturers' catalogues.

MESSRS. TRUSLOVE & CO., LTD., electrical engineers, of Colchester, have opened new showrooms and offices in High Street, West Mersea, where a supply of electricity is about to be given by the Colchester Corporation.

A Siemens Lamp Record.

We have now had an opportunity of trying over the gramophone record which SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., has produced in connection with its lamp-sales campaign (mentioned in our issue of August 30th, p. 372). On one side of this there is a fox-trot "The Popular Pair," with a vocal refrain introducing "Opal and Pearl." The other side carries a waltz entitled "Forget-me-Not." Both "numbers" are played by a jazz band and the recording is excellent. The compositions can be classed as light music and are therefore appropriate to the campaign. The company is to be commended for its enterprise in bringing its lamps before the public in such a novel manner.

Social Event.

On September 4th, through the kindness of the management, all the employés of M.K. Electric, Ltd., were given a holiday, and a party of about 160 journeyed to Clacton-on-Sea in five motor coaches. It was exceptionally hot, and a most enjoyable time was spent by the sea.

E.D.A. at Newcastle.

The display arranged by the BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION at the North-East Coast Exhibition has been very successful and has attracted a great deal of attention. Apart from a large number of visitors who have called to make inquiries, film displays have been given on 965 occasions with an attendance of nearly 38,000. In addition 31 displays were given to schools with an attendance of 1,100.

Unemployment.

A decrease of 3,503 in the number of unemployed persons was recorded for the week ended September 2nd. At that date the total was 1,152,300, as compared with 1,155,803 on August 26th, and 1,324,675 on September 3rd, 1928. During August the average numbers of persons on the registers of Employment Exchanges in Great Britain were 798,408 wholly unemployed, 289,649 temporarily stopped, and 73,994 in casual employment, making a total of 1,162,051. The figures for August, 1928, were: Wholly unemployed, 852,205; temporarily stopped, 387,783; casuals, 74,177; total, 1,314,115. On August 26th there were approximately 10,164,700 insured persons aged 16-64 in employment in Great Britain. This was 13,200 fewer than in the preceding month, and 254,500 more than a year before.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery into the Irish Free State during July last amounted to £35,539, bringing up the total for the first seven months of the year to £347,256 as compared with £246,711 in the corresponding period of 1928.

The Danish Electrical Industry.

The manufacture of electrical equipment in Denmark, while not so far advanced as in Sweden, is of growing importance. Production has progressed steadily during the past few years, and exports especially have shown notable gains. The chief items of manufacture are electric motors, installation material, telephone apparatus and dry batteries. The total annual production amounts to about £1,650,000, of which about one-third is exported—chiefly dry batteries and electric motors. The Danish cable and wire industry is also well estab-

lished, and supplies most of the home demand. The exports, however, on account of their price, are comparatively low, amounting to only about 18 per cent. of the total production.

Russian Orders for Germany.

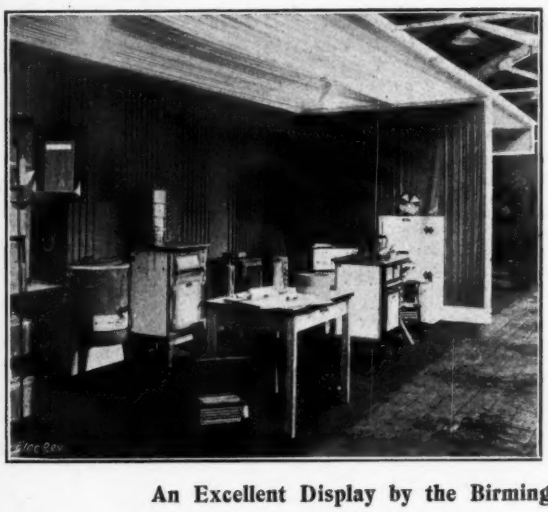
The Russian trading delegation in Berlin reports that it has placed order with a South German works for the delivery of two 24,000-kW turbo-generators for the Stalingrad electricity works, a number of h.p. oil switches for the Moscow supply works, and rectifier equipment for the Moscow Northern railway.

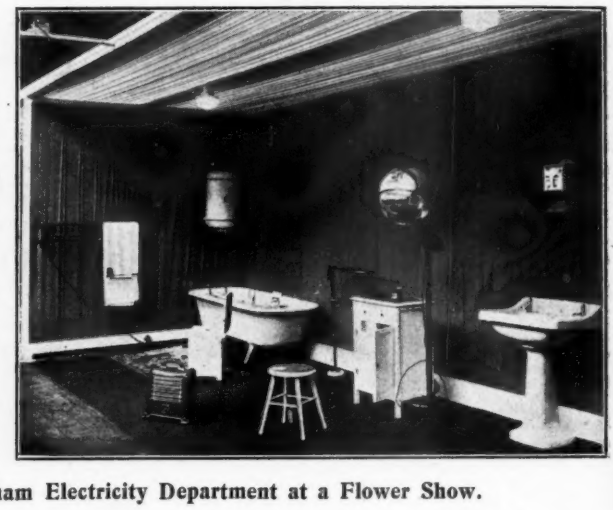
For Sale.

Messrs. Babcock & Wilcox, Ltd., have for sale a country-house lighting plant. Salford Corporation has for disposal 10 transformers. The Bishop's Stortford, Harlow and Epping Gas and Electricity Co. invites offers for two 50-kW, 220-250-V generators coupled to twin cylinder Crossley gas engines, and one battery charging booster. Plymouth Corporation invite tenders for the purchase and removal of five boilers with economisers, feed pumps, &c., four generating sets, negative boosters, centrifugal pumps, &c. (See our advertisement pages to-day.)

Electricity at a Flower Show.

At a flower show recently organised by the *Birmingham Gazette*, the Birmingham Corporation Electricity Department's exhibit consisted of a model dining room and lounge, bathroom and kitchen, illustrating in a practical manner the many uses of electricity in the home. In addition, a comprehensive range of appliances for water heating, room heating, &c., were shown on a separate section of the stand. A system of tubular heating for conservatories was shown, and also an electrically-driven lawn mower.





An Excellent Display by the Birmingham Electricity Department at a Flower Show.

Russian Electrical Imports.

According to a recent return the value of the electro-technical machinery imported into Soviet Russia during the fiscal year 1928-29 amounted to 22,636,000 roubles, as compared with 29,662,000 roubles in 1927-28.

Recent Contracts.

Messrs. Cunningham, Beard & Co. have recently received two orders from the Blackpool Corporation for over 1,000 lamp shades. They have many other contracts in hand, including decorative fittings for the "Astoria" Kinema, Dundee, and special fittings for Trust Houses.

Messrs. Petters, Ltd., Yeovil, have received an order for two 120-b.h.p. Atomic Diesel engines from the Holden Co., Ltd., Montreal, these engines being required for the Canadian National Railways at Nakina, Ontario, for direct coupling to alternators.

There are a number of interesting features in the lighting installation at the new Synagogue in Bury Old Road, Manchester, which was opened recently. The work was carried out by Messrs. Geo. H. Scholes & Co., Ltd., Manchester. Colour lighting has been arranged in the dome over the Ark and will allow of red, yellow, or blue effects being arranged as desired. The lights are concealed in the dome, in the centre of which there is also an open bowl light. Around the Ark there are also three-, four-, and six-light standards. In the body of the synagogue there are fittings set in the ceiling and also hanging lights all arranged in the form of a Cross of David.

In connection with the appointment of a Government Commission to examine the question of main-line electrification, Messrs. Johnson & Phillips, Ltd., point out that at present they have in hand for the Southern Railway Co. the h.p. cables for the Dartford-Gravesend and Twickenham-Windsor sections, representing an important addition to the 200 miles or so of similar cable already installed for that company in 1925-6. Another contract at present going through their shops is one for some 13 miles of 22,000-V .25 3-core cable for the Auckland Power Board. This, it is stated, is the first important underground transmission at such a high voltage in New Zealand. The company has in hand the complete town lighting scheme for Dunoon, and has secured the contracts for the cable and transmission line work in connection with the electrification of the towns of Holywood and Bangor, Northern Ireland. Telephone cable contracts at present in hand are represented by the Plymouth-Torquay and the Reading-Guildford-Basingstoke trunk lines.

Proposed German Tube Syndicate.

Efforts have recently been made to form a syndicate in Germany of makers of insulated tubes, including the A.E.G., the Bergmann Company and the Duisburg Cable Company. It has not been possible, however, to reach an agreement, although it is not intended to abandon the negotiations.

Book Notices.

"Year Book and Diary, 1929-30." (Pp. 130 and diary.) Edinburgh: Electrical Contractors' Association of Scotland. Price 3s. net.—This edition of the Year Book contains, as usual, full details of the Association's membership with portraits of the officers. A number of other useful features are included, such as an article on the Central Scotland Electricity Scheme, notes on contracts, a list of Scottish supply undertakings, &c.

"Short Stories in Science." By J. G. Crowther. Pp. viii +213. London: Geo. Routledge & Sons, Ltd. Price 5s. net.

We have received from Mr. A. F. Williamson, electrical engineer to the Public Works Department, Western Australia, a list of electricity supply stations of Western Australia, which includes the plant capacity, system, voltage, charges, &c.

"*Journal* of the Institution of Electrical Engineers," Vol. LXVII, No. 393. September, 1929. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

Italian Lamp Imports.

Hitherto between 15 and 20 million glow lamps have been imported into Italy annually, but this number is to be reduced by 90 per cent. now that the Società Italiana Osram has undertaken to supply the needs of the country. The remaining 10 per cent. consists of special types of lamps which will still have to be obtained from abroad.

The E.D.A. Outlet Campaign.

An Area Conference will be held in the Demonstration Bureau, 4, Fountain Street, Manchester, on September 23rd. Lt.-Col. W. A. Vignoles, D.S.O., Director of E.D.A., and other speakers, will deal with the principles underlying the Campaign and the methods which will be adopted to ensure its success. It is anticipated that a useful and interesting discussion will follow.

New Catalogues and Lists.

Messrs. A. W. Beuttell, Ltd., 96, Victoria Street, S.W.1.—An illustrated catalogue of "Linolite" reflectors, notifying a reduction in prices.

London Electric Wire Company & Smiths, Ltd., Church Road, Leyton, E.10.—A circular letter drawing attention to new developments for the coming season of "Lewcos" radio products, with prices.

Messrs. L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, W.C.2.—Two illustrated folders dealing with the "Coffield" electric ironer, and the "Universal" electric washer and dryer.

Corona Lampworks, Southern, Ltd., 23, Tavistock Square, W.C.1.—A circular announcing reductions in lamp prices, and a price list of wire-drawn and "half-watt" lamps.

MESSRS. FRY'S (LONDON), LTD., 24-6, Water Lane, E.C.4.—A leaflet advertising the "Stick-to" automatic centring device.

SIEMENS & GENERAL ELECTRIC RAILWAY SIGNAL CO., LTD., Central House, Kingsway, W.C.2.—Bulletin No. 13, describing street traffic signalling apparatus with particular reference to the company's system.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 202, illustrating in colour some excellent examples of the company's decorative glassware fittings. Priced.

THE HORSTMANN GEAR CO., LTD., Newbridge Works, Bath.—A well-produced loose-leaf catalogue, fully illustrated, dealing with the design and construction of "Newbridge" controllers for public street lighting, shop-window lighting, &c.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—An illustrated and priced booklet describing the company's radio receivers in some detail; a folder containing illustrations and prices of "Gecophone" loud speakers; and an interesting and useful booklet giving notes on radio reception by means of "Osram" valves.

THE MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon.—Two illustrated folders dealing respectively with blowing equipment and armature and commutator maintenance requisites. Also a pamphlet printed in German—one of a foreign-language series produced by the company.

Messrs. A. C. COSSOR, LTD., Highbury Grove, N.5.—An illustrated and priced booklet dealing with the new "Cossor" valve.

Messrs. EDWARD HOLME & Co., LTD., Moss Lane, Altrincham.—Illustrated and priced leaflets Nos. 202 and 203, giving particulars, respectively, of a.c. and d.c. brake solenoids.

CANTIE SWITCHES, LTD., Leighton Works, Carlton Road, Nottingham.—Leaflet No. 129, drawing attention to the company's range of ironclad switchgear. Illustrated.

JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—An illustrated and priced catalogue of electric fires.

We have received calendar-blotters for September from BERRY'S COMPOUNDS, LTD., Stratford Market, E.15, and Messrs. DE BRUNNER & LANG-SIMS, 3 and 4, King Street, Covent Garden, W.C.2.

Mr. CHARLES SELZ, 47, New Cavendish Street, W.1.—A card illustrating Mr. Selz's workshops and showrooms for the manufacture and display of lamp shades.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A pocket price list of a.c. 3-phase, 50-cycle motors.

Messrs. BURDETTE & Co., LTD., Pocock Street, S.E.1.—A well-produced brochure illustrating electrical installations carried out by the company in country houses, public buildings, factories, &c.

Mr. J. A. BROOK, 24, John William Street, Huddersfield.—Two leaflets drawing attention to the "Klip-Lamplok," "J. A. B.," and "Complete" lamp locks, with a list of users.

PARSONS OIL ENGINE CO., LTD., Town Quay Works, Southampton.—Publication No. 102/1929, illustrating and describing petrol and paraffin engines.

MESSRS. L. ANDREW & Co., 2, Whitworth Street West, Deansgate, Manchester.—Price lists Nos. 73/931, 73/943, and 73/951, dealing, respectively, with cables and wires, metal filament lamps, and bakelite insulated lampholders.

The Anglo-Argentine Trade Agreement.

In connection with the Foreign Office announcement of the negotiation by the British Mission under Lord D'Abernon of a provisional trade agreement between Great Britain and Argentina, the Associated Press correspondent at Buenos Aires reports that the President of the Argentine Republic has issued a decree making available for the British Government a credit of 42,000,000 dollars (£8,400,000) for the purchase of cereals and other produce from Argentina. A similar credit will be issued in London in favour of the Argentine Government for the acquisition of railway material.—*Reuter* (New York).

Liége International Exhibition, 1930.

Preparations, which are being made in Belgium to celebrate in 1930 the centenary of its independence, include an international exhibition at Liége, which will include science, industry and agriculture. Many countries have accepted the Belgian Government's invitation to take part, and a number of British concerns have decided to participate. The exhibition will be opened in May, 1930, for a period of six months, and will cover 150 acres of ground.

Central Electricity Board Contracts.

Three further contracts amounting to approximately £808,000 have been placed by the Central Electricity Board in connection with its schemes. The GENERAL ELECTRIC CO., LTD., has received an order for 132-kV overhead transmission lines for the Mid-East England Scheme. The erection work will be carried out by the Pirelli-General Cable Works, Ltd., Southampton. The contract covers the supply and erection of 320 miles of lines, which will be identical in construction with the overhead lines which the General Electric Co., Ltd., and the Pirelli-General Co. are now erecting for the Board in South-East England. The total value of the contract is £494,836. For the South-East England Scheme a contract for 33 kV and other cables has been placed with BRITISH INSULATED CABLES, LTD., and one for 33-kV and other switchgear with Messrs. A. REYROLLE & Co., LTD.

Canadian Electrical Imports.

The *Board of Trade Journal* states that during the fiscal year 1928-29 electrical apparatus valued at $26,775,215 was imported into Canada, an increase of $7,730,750 as compared with the preceding year.

Illumination Design Course.

The 20th Illumination Design Course is to be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, W.C.2, on successive Monday evenings during the coming winter. The first lecture of the series takes place on October 21st, and the course concludes with the seventh lecture on December 2nd. The programme will cover the more important fields of lighting, and the lectures will be revised to bring them in line with the latest practice. As in previous years, all members of the electrical trade are cordially invited to attend this course.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Sept. 17th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	2¾d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£189	£3 dec.
	Grade II... ... ... ,, ,,	£133	£2 dec.
	Grade III ... ... ,, ,,	£72	£1 inc.
c	Brass (rolled metal 2" to 12" basis) per lb.	10¾d.	...
c	,, Tubes (solid drawn) ... ,,	1/0½ to 1/1	...
c	,, Wire, basis ... ... ,,	11½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3	...
g	,, Bars (best selected) ... per ton	£110	...
g	,, Sheet ... ... ,,	£110	...
g	,, Rod ... ... ,,	£110	...
d	,, (Electrolytic) Bars ... ,,	£85	5/- inc.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£95	5/- inc.
d	,, ,, H.C. Wire per lb.	11½d.	...
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	10¾d.	½d. inc.
i	Iron, Pig (Cleveland No. 3.) ... per ton	72/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£25	...
g	Mercury ... ... per bot.	£22 5s. to £22 10s.	...
e	Mica (in original cases small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/8½	...
p	,, ,, wire... ... ... ,,	1/6½	...
o	Platinum ... ... per oz.	£13 17s. 6d.	...
d	Silicium Bronze Wire ... ... per lb.	1/3½	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£205 15s. to £206 5s.	£1 inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on September 14th, James Forster & Co. stated that the lead market displayed a steady tone last week, although the best prices were not maintained at the close. The declaration early in the week of considerable quantities of lead against September contracts established a contango on prices of 3s. 9d. a ton. There are no fresh features to report. Demand is still quiet in all consuming centres, while supplies are sufficient for all requirements, and there is nothing in the present position to affect values either way. The Board of Trade returns for August show imports of 29,268 tons and exports of 2,456 tons, leaving 26,812 tons for home consumption.

Lighting and Power Notes.

Bradford.—MAINS EXTENSIONS.—The Corporation Electricity Committee has recommended a scheme for the extension of h.p. mains from Valley Road power station to Roundhill Street transformer chamber, the provision of a transformer chamber in Bowling Old Lane district, &c., at a total cost of £24,000.

ELECTRICITY SUPPLY.—The Corporation Electricity Committee has agreed to the proposal of the Yorkshire Electric Power Co. to give a supply of electricity to the Leeds Fireclay Co. in the Tong Lane district.

Burton-on-Trent.—MAINS EXTENSIONS.—The Town Council is to extend the mains to Hartshorne from Woodville, and to lay a duplicate main from Woodville to the Milton waterworks, at an estimated cost of £6,393. Provided there is a guaranteed revenue of £200 per annum, an extension is to be made to Anslow at a cost of £848, and also to Stanton, at an estimated cost of £831.

Bury St. Edmunds.—NEW ELECTRICITY TARIFF.—The Town Council has adopted the following tariff, carrying with it the principle that the Electricity Committee be permitted to trade direct with consumers if found necessary:—Inclusive domestic rate where heating and cooking is installed: Fixed charge of 1½d. per kWh for lighting, heating, and cooking, less ½d. per kWh discount for prompt payment. Hire charges: Cookers, from 3s. 6d. to 7s. 6d. per quarter, with free wiring up to 30 ft.; fires, 1½ kW, 2 kW, and 3 kW, 2s., 3s., and 4s. per quarter upwards according to pattern, exclusive of wiring: kettles, 3-pint, 2s. per quarter upwards according to pattern; irons, 1s. per quarter; hire-purchase: an initial payment of 25 per cent. of the value of the appliance, and the balance, plus 5 per cent. per annum, to be spread over a period of from one to four years. Refrigerators: 2d. per kWh, less ½d. per kWh discount. The Committee is to submit proposals for the establishment of electricity showrooms.

Canada. — HYDRO-ELECTRIC DEVELOPMENTS. — The International Hydro-Electric System, through its subsidiary, the Gatineau Power Company, commenced delivery on September 3rd of an additional 50,000 h.p. of electrical energy to the Hydro-Electric Power Commission of Ontario. This quantity of power, originally scheduled for delivery on October 1st, increases to 130,000 h.p. the total energy now being delivered by the Gatineau Power Company to the Commission. The energy is being sent over a 220,000-V transmission line 230 miles long, and is being distributed by the Commission in the Toronto area to supplement the power from Niagara Falls. About October 15th the Gatineau Power Company will deliver a further 20,000 h.p. to the Commission, raising the total deliveries to 150,000 h.p. This 20,000 h.p. is part of the additional quantity scheduled under contract for delivery by October 1st, 1930, the delivery date being thus anticipated by nearly a year.

Cannock.—MAINS EXTENSIONS.—The Urban District Council has decided to carry out mains extensions to the Pye Green district, and also to the new coal distillation plant at the Cannock and Leacroft Colliery. It is also proposed to give a supply of electricity to Wimblebury, and sanction to a loan for carrying out the work has been applied for.

Carlisle.—MAINS EXTENSION SCHEME.—The Corporation Electricity Committee has decided, with a view to providing work, to seek a grant for a scheme for accelerating the laying of mains, within the next 12 months, at a cost of £13,000.

LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £2,400 for mains extensions.

CHANGE OF FREQUENCY PROTEST.—In connection with the North-East England Electricity Scheme, the Corporation Electricity Committee has decided that, having regard to the large expenditure involved in the proposed standardisation of frequency, representation be made to the Board protesting against the outlay for the purpose mentioned, on the grounds that the benefit obtained from such standardisation is more local than national in its application.

Continental.—SPAIN.—The Ministro de Fomento wishes to push forward as rapidly as possible the production of hydro-electric power in Spain in order to provide the chemical industry with the means of manufacturing 20,000 tons of nitrogen a year, so that the home market will be relieved of all necessity of importing this article.—*Reuter's Trade Service* (Madrid).

DENMARK.—Owing to the increased demand for electricity, especially in the large towns of Zeeland, and also to the high cost of imported coal and oil, Denmark is to obtain still further supplies of electrical energy from Sweden, and for this purpose a new cable is being laid under the Oeresund.

SWEDEN.—The Vattenfallsstyrelsen (Waterfall Board) is asking for an allowance of Kr. 10,100,000 in the next Budget for the development of hydro-electric power production in Sweden. Out of this amount, Kr. 2,500,000 is needed for work on a new power station at Vargoen, and Kr. 900,000 for two small power plants. The largest sum, Kr. 3,300,000, is for the extension of the power distribution system, and Kr. 1,900,000 is for the enlargement of the Porjus, Motala, and Vaesteraas stations.—*Reuter's Trade Service* (Stockholm).

FRANCE.—A concession has recently been secured by the Société des Forces Motrices de l'Agout, of Beziers, for the establishment of a plant to utilise the water power of the River Agout near Vabre-le-Bez (Tarn). It is estimated that a total of 15,650 kW is available.

GERMANY.—What is claimed to be the largest Ruths steam accumulator installation so far built has recently been completed at the central electric power station at Charlottenburg. The installation comprises sixteen vertical accumulators 68 ft. in height and 16½ ft. in diameter. The steam from the boilers is first used to operate turbo-generator sets at a pressure of 35 atmospheres, and from there it passes to the Ruths accumulators at a pressure of 13 atmospheres, and is finally used to drive additional turbo-generator sets.

ANDORRA. — The Prefect of the Pyrenees Orientales, who represents the President of the French Republic, has submitted to the Bishop of Urgal, co-Prince of Andorra, which is under the suzerainty of France and of the Bishop, a plan for the development of the hydraulic forces of the valleys of the State by a Franco-Spanish company. The Bishop of Urgal having approved this decree, the Prefect went to Andorra and formally handed over the document to the General Trustee of the Valleys. The concession provides that various power stations are to be built in Andorra; in exchange the holders of the concession are to construct a complete roadway system in Andorra, which has hitherto possessed little more than mountain tracks.—*Reuter's* (Paris).

Crewe.—HIRE-PURCHASE SCHEME.—The Town Council has adopted a hire-purchase scheme for installing electrical apparatus in consumers' houses.

Doncaster.—LOAN.—The Town Council has applied for sanction to a loan of £1,200 for an additional transformer station and h.p. feeder cable, to meet the demand for electricity in the easterly part of Wheatley Hills.

Dudley.—NEW CABLE.—The Shropshire, Worcestershire, and Staffordshire Electric Power Co. is to lay a cable from Springsmire sub-station to Hall Street sub-station.

Gower.—BULK SUPPLY.—The Rural District Council has prepared a scheme for the purchase of electricity in bulk from the South Wales Electrical Power Distribution Co., at a cost of £20,000.

Hampton.—APPOINTMENT OF ADVISORY COMMITTEE.—At a recent meeting of the Urban District Council it was reported that the conference regarding electricity supply had decided to recommend the immediate appointment of a local joint advisory committee, to consist of representatives of the London and Home Counties Joint Electricity Authority and of the councils of the boroughs of Kingston and Twickenham and the districts of East and West Molesey, Esher, Ham, Hampton, Surbiton, Teddington, Walton, and Weybridge, for the purpose of the submission to the Joint Authority of proposals to acquire any undertaking within the area over which a local authority has purchase rights.

Hockley Heath and Lapworth.—ELECTRICITY SUPPLY.—A supply of electricity is to be given to the district before the end of the year by the Birmingham municipal undertaking. The charges for lighting will be from 6½d. to 4½d. per kWh (according to consumption); for power and heating, from 2d. to 1½d.; and for water heating for domestic purposes, ½d. per kWh. The parish of Earlswood will be supplied early next year.

Ickleton.—POWER STATION FIRE.—The power station of the Ickleton Electric Supply Co. was destroyed by a fire which broke out early on Sunday morning, September 8th.

Isle of Thanet.—HOSPITAL INSTALLATION.—The Joint Hospital Board has decided to install electric lighting plant at Haine Hospital, Ramsgate, at an estimated cost of £3,244, and sanction to a loan has been applied for to cover the outlay

Leeds.—KIRKSTALL STATION.—The first section of the new power station now in course of construction at Red Cote, Kirkstall, will, it is officially stated, probably be completed early in 1930. The ultimate cost of the scheme is estimated to be approximately £2,000,000. The main line of the London, Midland & Scottish Railway crosses the site of the new station, and the Leeds & Liverpool Canal is also close at hand. It is by means of the canal and also by the River Aire that the station will be supplied with coal. This first section of the works represents a third of the whole scheme, the remainder of which will be completed and brought into operation as the demand for electrical energy increases.

London.—SHOREDITCH.—*Year's Working.*—The report on the working of the borough electricity undertaking for the year ended March 31st last records a gross profit of £81,064. After meeting loan charges, income tax, bank interest and special expenditure, there was a net surplus of £13,710, of which £10,000 was placed to reserve for renewals, and £2,500 to reserve for insurance, the balance of £1,210 being carried forward. The capital expenditure during the year amounted to £79,584, bringing the total now spent on the undertaking to £902,381. The number of consumers increased from 7,127 to 9,859, and the sales of electricity from 18,771,497 to 21,229,551 kWh. Under the rental wiring scheme 2,432 new installations were provided, the total up to March 31st standing at 5,382. The total revenue from slot meter supplies was £13,323, as against £6,528 in 1927-28.

At a recent meeting of the Borough Council, the Electricity Committee reported that application for the supply of electricity were being received at the rate of over 60 a week, and recommended, therefore, that the expenditure of £20,000 on free wiring installations be approved.

Manchester.—PROGRESS DURING JUNE.—During the month of June the Corporation electricity undertaking showed an increase in connections of 1,822 kW, bringing the total up to 390,276 kW. The number of applications received for supply, including those for additional supplies, amounted to 810, and represented a total of 1,602 kW. The number of hired cookers connected increased by 70, making the total number of hired cookers actually connected 5,402. Applications for the hire of cookers totalled 68. Two new sub-stations were put into commission, and additional plant was installed in a number of existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 7,005 consumers up to July 12th, and sanction had been given and work was in progress involving 1,412 consumers. Sanction has also been given to the change-over in the Denton and Alexandra Park areas involving 652 consumers.

Penang.—GEORGE TOWN.—*Year's Working.*—We have received from Mr. T. Rogers, engineer of the Municipal Electricity Supply Department, a copy of his report, together with a statement of accounts, for the year ended December 31st last. The total income showed an increase from £139,088 to £155,782, the working expenditure also rising from £78,150 to £86,013. The gross profit was £69,769, which compares with £60,930 in the preceding year. To the gross profit was added a sum of £802, being interest on investments, making £70,571 available. Interest on loans absorbed £37,158, and contribution to sinking fund a further £5,461, leaving a net surplus of £27,952, as against £23,078 in 1927. The capital expenditure during the year amounted to £105,638, and included £73.378 for machinery and plant and £18,097 for mains and services. The total now spent on the undertaking stands at £968,732. The electrical energy sold increased from 9,583,048 to 10,879,514 kWh, and the maximum supply demanded from 3,464 to 3,950 kW. At the end of the year 1,165 new consumers had been connected and 245 applications for supplies were in hand. Good progress was made in extensions of supply on the mainland, 554,641 kWh being sold, as against 173,375 in 1927. This figure would have been considerably larger but for a very late delivery of the plant for the Straits Trading Co. It is estimated that for a full year's working 1,250,000 kWh at least will be consumed on the mainland. During the year the new British Thomson-Houston 5,000-kW turbo-generator was put into commission.

Portsmouth.—SPECIAL ORDER.—The Corporation Electricity Committee is seeking an Order to enable the department to supply electricity to the parish of Hambledon.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

DOUGLAS (ISLE OF MAN).—Late shop-window lighting: From 4d. to 3d. per kWh.

GRAYS.—Lighting: 6d. per kWh up to 100 kWh (instead of up to 1,000 kWh), 5½d. for next 1,000, and 5d. beyond. Power: Up to 500 kWh, reduced from 2½d. to 2d. per kWh, and for next 3,500 from 2d. to 1½d. Running charges in alternative two-part tariffs for domestic and business premises: From 1½d. to 1¼d. per kWh. Cooking, through separate prepayment meter: 2d. per kWh, with rebate of 2d. in each shilling collected over the first 10s.

LONDON.—*St. Pancras.*—Lighting, flat rate: From 3½d. to 3d. per kWh. Power: From 1d. to ¾d. per kWh. Charge under small dwellings scheme: From 6½d. to 5½d. per kWh, and from 5d. to 4d. in the case of the Brookfield estate consumers.

South Shields.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £5,000 for an assisted wiring scheme.

Special Orders.—Application has been made to the Electricity Commissioners to amend the draft Special Orders by the Aldershot Gas, Water and District Lighting Co. so as to include in the area of supply certain parishes in the rural districts of Horsham, Midhurst, Petworth, and Westhampnett, and by the Ilfracombe Electric Light and Power Co., Ltd., to include the parishes of West Down, Bittadon, and Georgeham, in the rural district of Barnstaple.

The Electricity Commissioners have submitted to the Ministry of Transport a Special Order made by them authorising the Southern Tanning Co. (1920), Ltd., to supply electricity in part of the rural district of Salisbury.

Torquay.—SPECIAL ORDER.—The Town Council has applied for a Special Order to supply electricity in the urban district of Ivybridge, and to certain parishes in the rural districts of Kingsbridge and Totnes. The Council has also decided to oppose a similar application by Mr. W. G. Heath.

United States. — HYDRO-ELECTRIC DEVELOPMENTS. — The Niagara Hudson Power Corporation, the 450,000,000-dollar concern recently formed by Messrs. Morgan & Co., has, through the purchase of the Frontier Corporation, acquired sites on the St. Lawrence River capable of developing 2,400,000 h.p. The Morgan system now controls nearly every important water power site in New York State.—*Reuter* (New York).

Uttoxeter.—FRINGE ORDER OPPOSED.—It was reported at a recent meeting of the Rural District Council that the North-West Midland Electricity Authority was opposing the application of the Trent Valley and High Peak Electricity Co., Ltd., for a Fringe Order under which a transmission line would pass through Abbots Bromley.

Walsall.—RATE RELIEF QUESTION.—The Town Council Finance Committee has asked the Electricity Supply Committee to report whether it thinks it desirable to increase the limit of the profits from electricity undertakings which may be applied to the relief of the rates.

Weymouth and Melcombe Regis.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. George Nicolson) for the twelve months ended March 31st last show a total revenue of £33,057, as compared with £31,408 in the preceding year. The working expenditure decreased from £18,701 to £16,719, and there was a gross profit of £16,337, as against £12,707 in 1927-28. To the gross profit was added income from other sources, making a total of £17,224 available, and after providing for capital and other charges there was a net surplus of £6,764, as compared with £4,977 in the preceding year. The capital expenditure during the year amounted to £57,714 and included £33,282 for machinery and £20,882 for mains and services. The sales of electrical energy increased from 2,193,475 to 2,588,898 kWh and the maximum supply demanded from 1,265 to 1,492 kW. The average price obtained per kWh fell from 3.32d. to 2.96d.

ELECTRICITY SUPPLY.—The Town Council has decided to give a supply of electricity to Preston and Osmington at a cost of £5,787.

Tramway and Railway Notes.

Aberdeen.—YEAR'S WORKING.—We have received a copy of the report, together with an analysis of the accounts, of the City Tramway Department for the year ended May 31st last. The total revenue amounted to £161,965, and the working expenditure was £131,542, leaving a gross profit of £30,423. The figures for the preceding year were: Income, £153,268; working expenses, £125,263; gross profit, £28,005. To the gross profit was added £4,838 from interest on investments, and £1,115 unemployment grant, making a total of £36,372 available. From this sum the following charges had to be met: Loan interest, £7,288; depreciation and renewal account, £14,624; contribution to sinking fund, £4,013; income tax, £3,404; and special expenditure, £664. There remained, therefore, a net surplus of £6,377, as compared with £6,184 in 1927-28. During the year the capital expenditure amounted to £4,183, making the total now spent on the undertaking £657,394. The number of passengers carried increased from 39,557,263 to 41,584,797, and the car miles run from 2,702,548 to 2,807,796. The total income per car mile was 13.74d., as compared with 13.51d. in the preceding year.

Argentina.—BUENOS AIRES.—The Compania Anonima de Proyestos y Construcciones de Madrid has proposed to the municipality a scheme for the construction of an extensive system of underground railways.

Australia.—SYDNEY.—The electrification of the suburban railway lines is now nearing completion, and it is hoped that the remaining sections, *viz.*, Lidscombe—Cabramatta, Tempe—East Hills, and Granville—Liverpool, will be finished by December next. Last year £1,500,000 was spent on the work and when completed the scheme will have cost £14,000,000.

Continental.—AUSTRIA.—In a recent issue of *Electrotechnik und Maschinenbau*, of Vienna, Herr O. Nebesky gives some details of a Diesel-electric locomotive, the first of its kind to be put in service on the secondary lines of the Austrian State railways. The locomotive is fitted with a Diesel six-cylinder engine developing about 200 h.p., which is coupled direct to a twin dynamo, each machine being separately excited. The engine is of the six-wheel type, only two of the axles, however, being motor driven. The twin dynamo is adapted to be run as a motor by current from a battery for the purpose of starting the engine. The locomotive, which weighs about 37 tons, is being used for the haulage of trains weighing about 65 tons, over a daily distance of approximately 140 miles, at maximum and average speeds of, respectively, 37½ and 28 m.p.h.

Droylsden.—TRAMWAY LEASE.—The Urban District Council is to grant a lease to the Manchester Corporation for the purpose of running a tramway service through Manchester Road and Ashton New Road. The term of the lease will be 21 years, commencing June 1st, 1923.

Irish Free State.—DUBLIN.—It is stated by *The Times* that the report of the Court of Inquiry into the tramway strike was officially issued on Tuesday evening. The men were asked

to agree to a reduction of 1s. per week in wages. To this reduction, it is understood, the men agreed. It is also learned that the tramway company has accepted the report, and the strike may accordingly be regarded as ended.

Liverpool.—Night Tramway Noise.—With regard to the alleged excessive noise caused by the running of tramcars on certain routes at night, the Tramway Committee has prepared for consideration at its next meeting a time-table for the substitution of 'buses between 10.30 p.m. and 6 a.m. in the city.

Penang.—George Town.—The accounts of the Municipal Tramway Department (manager: Mr. T. Rogers) for the year ended December 31st last record a total revenue of £33,006, as compared with £34,989 in the preceding year. Working expenses totalled £24,690, as against £26,583, leaving a gross profit of £8,316 (£8,406). Income from other sources was added to the gross profit, making a total of £8,902 available. After providing for capital and other charges there was a net surplus of £1,321, as compared with £1,482 in 1927. The capital expenditure amounted to £9,235, and included £1,939 for permanent way renewals and £6,526 for railless-car equipment. The number of passengers carried during the year, including 'bus passengers, increased from 8,468,368 to 8,951,462.

South Shields.—Automatic Indicators.—At a recent meeting of the Tramways Committee the manager reported that he had evolved an automatic machine which would inform passengers in the cars of the next stopping place, and that the apparatus had been patented. It had been possible to incorporate in the moving indicator a space for advertisements, so that advertising revenue would more than pay for the installation of the apparatus. The estimated cost would be £36 per tramcar and £9 per motor-'bus, there being four machines in a tram and one in a 'bus. He asked for permission to fit up a tram and a 'bus with the apparatus for experimental purposes, and the Committee granted his request.

Telegraph and Telephone Notes.

Austria.—Telegraph Service.—According to a report lately issued, there were 7,762 miles of telegraph lines, representaing 48,780 miles of wire and cable, in operation in Austria at the end of 1927, of which 29,822 miles were operated by the State. Of the Government wires, 2,032 were of bronze, 21,200 of iron, and 6,590 of underground cable. Altogether 1,909 telegraph instruments, mainly Morse, were installed, of which, however, only 1,762 were in use.

Chili.—Communication Services.—There are now 45,342 miles of telegraph wires in operation in Chile, or 11.3 mlies per 1,000 of the population. The number of telephone instruments in use in the country is given as 30,764, or only 7.6 for each 1,000 inhabitants.

Germany.—Automatic Telephony.—On September 14th every telephone subscriber's apparatus at Cologne was connected with an automatic exchange. The automatic system has been in operation at several of the exchanges for some time, and by a further extension of the system all the city's nine exchanges were rendered automatic. There are eight telephone subscribers to each one hundred of the city's three-quarters of a million population.—*Reuter's* (Cologne).

International Telephony.—Holland.—The Dutch Post and Telegraph Authorities have lately placed a contract with the Siemens and Halske Co., of Berlin, for the construction and installation of a new underground long-distance telephone cable between Meppal and Deventer. The new line, which will be about 40 miles in length, will connect central Holland with the telephone service in northern Holland and with that of Germany, *via* Emden. The cable will comprise 86 double conductors.

France.—A new underground telephone cable between Paris and Marseilles has just been put in operation, to be followed almost immediately by a similar cable between Paris and Bordeaux. The cables, with extensions covering the principal towns on the Riviera, will greatly facilitate communication between Paris and the Mediterranean coast.

Japan.—Telephone Service.—According to a report from Tokio, the Japanese Post and Telegraph Authorities are establishing about 100,000 miles of additional telephone lines during the present financial year.

Manchuria.—Telegraph Stations Destroyed.—It is reported from Mukden that in the hostilities between Soviet Russia and China the Pogranichnaya telegraph office and wireless station have been destroyed.

Portugal.—Telephone Concession.—Representatives of an English company have laid before the Government a scheme for the organisation of a national telephone service in Portugal with exchanges in every town of the country and connections with the international trunk lines. It offers to erect the whole system free of cost to the State in return for a concession giving it a monopoly for a certain number of years. During the period of the concession the Portuguese Treasury would receive 2 per cent. of the gross receipts and 50 per cent. of the net receipts, and at its expiry the whole system would be handed over to the State. It is stated that the whole of the proposed system could be in working order in two years.—*Reuter* (Lisbon).

Switzerland.—League of Nations.—The desirability of the League of Nations possessing its own wireless station in times of crisis was discussed by the Third Committee on September 11th. A resolution submitted by Viscount Cecil of Chelwood proposed that steps should be taken as soon as possible for the provision of a station capable of establishing independent direct communication between members of the League in all parts of the world. It was approved in principle and referred to a Joint Committee.

The Telephone Service.—Increase in Traffic.—The total number of telephone stations in the Post Office system at June 30th, 1929, says the September number of the *Telegraph and Telephone Journal*, was 1,786,865, an increase of 10,995 on the total at the end of the previous month. They were divided as follows:—London, 638,884; England and Wales (excluding London), 966,538; Scotland, 159,288; Northern Ireland, 22,155. London's total increase for the month was 4,405 and that of the provinces 6,590. Residence rate subscribers increased in London by 1,261 to a total of 154,108, and in the provinces by 1,835 to a total of 242,285. Call office stations, including kiosks, increased over the whole country by 699 to a total of 26,920. Rural railway stations connected with the telephone system increased by 12 to a total of 1,146. The total number of inland trunk calls dealt with during April (the latest statistics available) was 9,539,701, an increase of 1,050,409, or 12.4 per cent. over the total for the corresponding month of the previous year. Outgoing international calls in April numbered 43,002, and incoming international calls 45,829, representing increases of 11,113 (34.8 per cent.), and 10,277 (28.7 per cent.), respectively, over April, 1928.

New Automatic Exchanges.—The Mitcham automatic exchange, which commenced service on September 11th, has an initial capacity of 750 lines, but is capable of extension to 1,480 lines.

Situated in Wood Street, Cheapside, the new Metropolitan and National automatic exchanges, which commenced service on August 31st and September 7th, respectively, in the Greater London telephone area, are unique in that they are both accommodated in one building, which will also ultimately house the equipment of a third 10,000-line exchange, to be known as Empire. There will thus be no less than 30,000 lines of Strowger equipment, made and installed by the Automatic Telephone Manufacturing Co., Ltd., to the order of the Post Office, in a single building situated in the busiest centre of the metropolis.

Subscribers in the Chelsea area were transferred to the new automatic Flaxman exchange on September 14th.

Radio Notes.

Canada.—Royal Commission.—The Royal Commission on broadcasting in Canada, which during the past year has been investigating conditions in Great Britain, the Continent of Europe, and throughout the Dominion, has issued its report. It recommends that broadcasting in Canada "should be placed on the basis of a public service, and that stations providing a broadcasting service should be owned and operated by one national company," which should have somewhat similar relations to the Federal Government as obtained in the case of the Canadian National Railways, but with a distinct organisation and joint federal and provincial control. The Commission further recommends the establishment of a Federal Board, consisting of twelve members, three representing the Federal Government, with one representative of each of the nine Provincial Governments. It is recommended that a series of high power stations be erected across Canada as the nucleus of a publicly-owned broadcasting service, and that the company controlling them should be vested with all the powers of private enterprise; that a provincial radio broadcasting director should be appointed for each province, having full control of broadcast programmes within the boundaries of his province; that compensation be allowed to private owners of existing stations for apparatus taken over; that adequate arrangements be made for a chain of broadcasting stations; that a specified time be made available for educational work, and, finally, that the broadcasting of political subjects should be carefully restricted under arrangements mutually agreed upon by all political parties. Federal legislation will be necessary to give effect to the recommendations.—*Reuter's* (Ottawa).

Iceland.—New Station.—The Marconi Company has received a contract from the Icelandic Government for the construction of a high-powered wireless station in Iceland. Work will be started in the near future. It will have a 16-kW transmitter and will be of great value for weather reports in addition to serving the comparatively small local population of 100,000 with broadcast entertainment.

The station will be ready for use next June, says *The Times*, and is expected to transmit on a wave-length of about 1,200 metres. The station will also be equipped with telegraph apparatus in order that meteorological information, which is of such importance to Europe generally, may always be transmitted. It is understood that the meteorological office of the Air Ministry has had some difficulty in receiving its information from Iceland by wireless hitherto.

It will be the first broadcasting station to be erected in Iceland and will be situated at Reykjavic, the capital. The transmitter will be of a new design and special circuits will be incorporated to enable it to be used for telegraph transmission as well as broadcasting.

Irish Free State.—LICENCES.—According to the Parliamentary Secretary to the Minister for Posts and Telegraphs, 26,000 listeners' licences were issued last year, or 9 per 1,000 of the population, an increase of 2,000 on the previous year.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—November 4th. Argentine State Railways. Turbo-generator sets and headlights for locomotives. (B.X. 5657.)*

Australia. — MELBOURNE. — State Electricity Commission. November 4th. 6,600-V automatic voltage regulators and spares (B.X. 5637.)* Circuit breakers, operation recorders. (B.X. 5677.)

November 25th. Watt-hour meters, recording instruments, and remote metering equipment. (B.X. 5614.)* Switchgear and accessories for the Yallourn power station. (B.X. 5636.)*

Posts and Telegraphs Department. November 12th. Telephone receivers and parts. (B.X. 5656.)* Transmitters and parts. (B.X. 5653.)*

November 19th. Telephone generators and motor generators. (B.X. 5662.)*

Birkenhead.—September 24th. Mersey Railway. Electrical sundries, lamps and fittings. Forms of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

Birmingham.—September 30th. Board of Guardians. Lighting installation at the Witton Hall Institution, Erdington. Mr. N. W. Greenway, Lloyd's Bank Chambers, New Street, Birmingham. Deposit £2 2s.

Devizes.—September 25th. Rural District Council. Electric lighting installation, houses, Wasterton, Great Cheverell, Market Lavington, West Lavington, and Worton. Mr. P. R. Trapp, clerk, Maryport Chambers.

Dublin.—September 23rd. Borough Commissioners. Wiring for electric lighting 421 houses in Donnycarney Housing Area. Specifications (21s.) from the City Treasurer's Office, Exchange Buildings, Lord Edward Street.

Edinburgh.—September 28th. Midlothian and Peebles District Asylum. Electrical fittings, for six months. Mr. C. L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

September 28th. Corporation. Installation of electric lighting in 72 houses. Specifications from the Electrical Engineer's Office, Dewar Place. Deposit £1 1s.

Egypt.—October 16th. Ministry of the Interior. Electric motors, pumps, mechanical filters, &c. (A.X. 8373.)*

October 10th. Supply and erection of a generating station for Tala. (B.X. 5647.)*

Erith.—September 30th. Electricity Department. H.p. switchgear, transformers, and sub-station equipment. (See this issue.)

Glasgow.—October 8th. Tramways Department. Water-tube boiler plant, one 10,000-kW turbo-alternator with condensing plant and auxiliaries, and e.h.p. switchgear and control gear for Pinkston power station. (See this issue.)

Grimsby.—October 4th. Electricity Department. Supply of l.p. cables. (See this issue.)

Halifax.—October 7th. Waterworks Committee. Electrician's work in connection with the erection of filter house, &c. Particulars from Mr. A. C. Tipple, borough engineer (deposit £2 2s.).

Hastings.—October 3rd. Electricity Department. 11-kV metal-clad switchgear and one 5,000-kVA outdoor type transformer. (September 13th.)

Horsham.—September 27th. Electricity Department. 125-kW rotary convertor, step-up transformer, two draw-out truck-type e.h.p. switch units. Sub-station equipment. Two 100-kVA transformers. E.h.p. switchgear, l.p. switchboard and cable work. One e.h.p. feeder cable. (September 13th.)

India.—October 11th. South Indian Railway Co., Ltd., Madras. Electrification of suburban services, overhead contact and distribution lines. (September 13th.)

October 2nd. India Store Department. 20,000 sac elements, No. 1 size. (August 30th.)

September 25th. 200,000 telegraph insulators, porcelain and composition. (September 13th.)

DELHI.—December 3rd. India Stores Department. Ceiling and table fans. (B.X. 5672.)*

Kingswood (Surrey).—Electric lighting installation, Parish Church. Mr. W. S. Lloyd, warden, Spencer House, Tadworth.

Leeds.—October 4th. Board of Guardians. Installation of electric lighting at the two children's homes, Roundhay. Mr. J. H. Ford, clerk to the Guardians, 11, South Parade, Leeds.

London.—METROPOLITAN ASYLUMS BOARD.—October 2nd. Installation of electric bells at Paddington Casual Ward; new storage battery for T.S. *Exmouth*; alterations to electric lighting installation at Eastern Fever Hospital. (August 30th.)

September 24th. H.M. COMMISSIONERS OF WORKS. Steam generating set, control panel, &c. H.M. Office of Works, King Charles Street, S.W.1.

GREAT WESTERN RAILWAY.—October 8th. Supply from November 1st of telegraph instruments, electrical apparatus (insulators), &c., electric wires and cables, and electric lamps. (See this issue.)

SOUTHWARK.—October 22nd. Borough Council. Electric cables for 12 months. (September 13th.)

New Zealand.—WELLINGTON.—Post and Telegraph Department. October 30th. Head telephone receivers. (B.X. 5603.)*

October 7th. 70,000 small galvanised steel insulator bolts. (B.X. 5681.)*

Corporation. September 30th. Electric motors, starters and switchgear for the Milk Department. (B.X. 5508.)*

October 21st.—H.p. and l.p. switchgear. (B.X. 5649.)*

December 10th. Public Works Department. Three single-phase oil-insulated water-cooled transformers and accessories. (B.X. 5600.)*

October 8th. Electric ranges, radiators, and water-heaters. (B.X. 5642.)*

AUCKLAND.—September 23rd. Auckland Electric Power Board. Pilot cable and joint boxes. (B.X. 5643.)*

November 4th. L.p. porcelain insulators, ironwork, &c. (B.X. 5648.)*

Salford.—September 23rd. Electricity Department. One 10,000-kVA, 33-kV transformer for outdoor service at Trafford sub-station. (September 6th.)

Southend-on-Sea.—Electricity Department. Supply of 1,500 current limiters. (See this issue.)

South Africa. — JOHANNESBURG. — October 17th. South African Railways and Harbours. One 10-ton electrically-driven overhead travelling crane. (A.X. 8463.)*

October 17th. Municipal Council. Supply of tramcar motors. (B.X. 5664.)*

SALISBURY.—October 17th. Municipal Council. H.p. cables, transformers, &c. (B.X. 5604.)*

Turbo-alternators, steam piping, crane and switchgear. (B.X. 5607.)*

CAPE TOWN.—October 16th. Electricity Department. Paper insulated cables. (B.X. 5640.)*

Wolverhampton.—September 27th. West Midlands Joint Electricity Authority. Supply and erection of a double-circuit 33,000-V, 3-phase, 50-cycle overhead (steel tower) transmission line. (August 30th.)

September 26th. Education Committee. Installation of electric light and power at the Wolverhampton Grammar School. (August 30th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bangor (Co. Down).—Borough Council :—
Cables (£33,000).—Johnson and Phillips, Ltd.
E.h.p. switchgear (£190).—Metropolitan-Vickers Electrical Co., Ltd.
H. & l.p. switchgear (£2,192).—Geo. Ellison, Ltd.
Miscellaneous (£850).—Chamberlain and Hookham, Ltd.
—*Irish Builder and Engineer.*

Bradford.—Markets Committee. Accepted :—
Electric lighting improvements at Kirkgate market (£296), plus 10 per cent. departmental charges. Fittings (£196).—City Electricity Department.

Carlisle.—Electricity Committee. Accepted :—
Circulating water pipe lines (£1,048).—Pratchitt Bros.
Cast-iron water valves (£498).—Blakeborough & Sons, Ltd.

Dudley.—Housing Committee. Accepted :—
Electrical installation at 564 houses on the Priory estate (£2,566).—Cook & Son.

London.—WAR OFFICE :
Electric lamps.—General Electric Co., Ltd.
SOUTHERN RAILWAY.
Electric lamps.—Edison Swan Electric Co., Ltd.
GENERAL POST OFFICE.
Electric lamps.—Edison Swan Electric Co., Ltd.
ST. PANCRAS.—Contracts and Stores Committee.
Electrical installation at Block E of the Wolcot Street housing scheme (£375).—F. H Smerdon.
CENTRAL ELECTRICITY BOARD.—The following contracts, value £808,000, have been placed by the Board :—
SOUTH-EAST ENGLAND.—
33-kV and other cables.—British Insulated Cables, Ltd.
33-kV and lower voltage switchgear.—A. Reyrolle and Co., Ltd.
MID-EAST ENGLAND.—
132-kV overhead transmission lines.—General Electric Co., Ltd.

Portsmouth.—Electricity Committee. Accepted :—
Four 100-kVA 11,000/400-V transformers (£84); six 200-kVA ditto (£124); two 300-kVA ditto (£163); and two 500-kVA 6,600/400-V ditto (£234).—Hackbridge Electric Construction Co., Ltd.
Mental Hospital Committee. Accepted :—
Magneto switchboard for mental hospital.—Western Electric Co., Ltd.

South Shields.—Electricity Committee. Accepted :—
60-kVA condenser with switchgear (£225).—British Insulated Cables, Ltd.

Forthcoming Events.

Shipping, Engineering and Machinery Exhibition.—September 12th-28th. Olympia, W.

Association of Supervising Electrical Engineers.—Saturday, September 21st. Visit to the Shipping, Engineering and Machinery Exhibition, Olympia, W. Paper to be read on "Electricity as Applied to Modern Commercial Shipping." Mr. S. B. Donkin.

National Radio Exhibition.—September 23rd-October 3rd. Olympia, W.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

Small transformer iron stampings.
LENNOX blowers.
SOL-VELLUM lighting bowls.
SPLENDIDIA irons.
SELESIA tubing (about ¼ in. diam.).
RENUALL iron elements.
Toasters made or handled by Hector C. Adams.
We also have an inquiry for the address of Segner and Co., makers of sal-ammoniac.
We have a request for the address of Mr. W. E. BOOKER, said to have been with Electric Control, Ltd., last year.

Notes.

Fatalities.

An inquest was held at Newcastle on September 10th on Richard Burgess (70) and Florence Gill (11), who were killed in an explosion in the Newcastle Cloth Market on August 16th, when sixteen others were injured. According to the *Birmingham Post*, on the morning of the explosion gas was detected, and later smoke was seen coming from the premises of Messrs. Humble and Glenton, where the explosion occurred. Herbert Burrows, superintendent of the fire brigade, said that in the basement of the next house an earthenware duct was discovered containing electric cable which had been subjected to heavy current. Mr. Arthur Gregstone Shearer, electrical superintendent for the Newcastle-upon-Tyne Electric Supply Co., said the current was supplied on the three-wire system. Cables were tested every day, and at 6.40 a.m. no leakage was detected. At three minutes to eight the switchboard at the station showed that a serious fault had occurred. This was traced to the back of the house, where the explosion took place. After the explosion investigations showed that the ground round the cable was hot. Tiles were removed, and it was found that owing to the extremely high temperature the bitumen had melted and produced a gas containing hydrogen. The gas escaped into the cellar of Messrs. Humble and Glenton. Had it got out of the ground no explosion would have occurred. The bitumen cables are being replaced by a rubber compound cable. The jury returned the verdict that death was due to injuries from an explosion of bitumen gas caused by a defective electric cable.

Victor Charles Rogers, aged 11 years, climbed a standard carrying a 10,000-V main at Great Blakenham, on September 9th, and touched one of the h.p. lines, receiving a fatal shock

Nottingham Society of Engineers.

The programme for the 1929-30 session opens at the Nottingham Mechanics' Institution on Friday, October 11th, with the annual meeting. During the session the following lectures of electrical interest will be delivered :—

November 8th.—Engineering Costing.
December 13th.—The Colliery Laundry, Prof. W. H. McMillan.

1930.

January 17th.—Surface Condensing Plant, Mr. A. Beeston.
January 31st.—Manufacture and Installation of Colliery Cables, Mr. W. T. Anderson.
February 14th.—Oil Engines, Mr. J. M. Dickson.
The annual dinner will be held on December 6th.

Agricultural Machinery at the North-East Coast Exhibition.

Since August 26th part of the Newcastle-upon-Tyne Electric Supply Co.'s stand in the Palace of Engineering has been equipped with agricultural machinery electrically operated. The main exhibit is a complete modern dairy equipment, comprising steam-heated pasteuriser, sterilising chest, and churn cleaner, with milk-cooling, bottle-washing, and cleaning plant, all by Messrs. Barford & Perkins, Ltd. The steam required is raised in an electric boiler by Messrs. A. Reyrolle and Co., Ltd., and all the hot water required is provided by a Ferranti electric water heater. There is also a Lister self-contained electrically-driven cream separator, with a belt-driven churn, adjacent to which can be seen a Gascoigne electrically-driven milking machine capable of dealing with 10 cows. Another exhibit of much interest is the 2½-h.p. Ransomes, Sims & Jefferies electric motor, mounted complete with starter and reel of trailing cable on a portable bogey for use on any part of the farm. The interesting feature of this motor is that with it is incorporated a gear box from which five speeds are obtainable, thus allowing farm machines of varying speeds to be driven without the intervention of a countershaft. This motor is shown driving a Harrison, McGregor & Co.'s turnip cutter, while adjacent, and capable of being driven by the same motor, is a Bamford cake crusher. The electrically-driven "Sihi" self-contained pump shown in operation is of much interest, as there is no foot valve, and priming is unnecessary. Nearby is a Wolseley electrically-operated clipping and shearing machine.

In the centre of the stand is shown an electrically-heated Stephens incubator of 150 chicks capacity, the temperature of which is controlled by a thermostat. The heat, however, of the electrically-heated "Inventum" brooder used in conjunction with the incubator is controlled by a 3-heat switch.

Visitors to the Exhibition easily recognise the company's stand from the life-sized model of a Friesian cow mounted above the stand, the realistic movements of which are electrically controlled. Owing to the limitations of space, it has not been found possible to show the heavier sizes of electrically-operated farm machinery, such as chaff cutters, grinding mills, threshers, and crop-drying machines, but large photographs of this class of machinery are exhibited on the stand. In conjunction with this stand, a kinematograph film depicting the labour-saving advantages of electricity on the farm is being shown daily at the British Electrical Development Association's stand in the Palace of Industry.

Radio Lighthouse.

The Clyde Lighthouse Trustees have decided to install experimentally at Cumbrae lighthouse a device to broadcast the fog signal from that lighthouse by wireless telephony simultaneously with the ordinary fog signal. Mr. Charles A. Stevenson, C.E., the inventor, is a Glasgow man, and he described his invention to the committee. The new device, he explained, would enable mariners to tell instantly how far they were from the lighthouse, and also acquaint them of the source with the signal. The apparatus was very simple in principle, but had never hitherto been used.

Illumination of Newspaper Contents Bills.

The *Newspaper World* of September 7th, 1929, contains the suggestion that publishers might note that in the failing evening light evening paper contents bills lose much of their effectiveness. Newsagents can display bills so that artificial light falls upon them, but street-sellers are not so fortunately placed. If boards were provided with a curved-over light at the top to illuminate the bills, not only would the light add to the value of the bill, but would attract attention and be of general advertising value.

Educational.

THE ROYAL TECHNICAL COLLEGE, GLASGOW.—Evening classes commence on September 23rd, and day classes on September 24th. The calendar for 1929-30 is now available, and can be obtained from the Secretary.

THE LONDON POLYTECHNIC.—The prospectus of the wireless and high-frequency courses for the 1929-30 session is now available. The courses extend over a period of five years and provide a thorough training in the principles and technique of the subject.

BRIGHTON TECHNICAL COLLEGE.—The calendar for 1929-30 is now available. The winter session began on September 17th, and evening classes on September 16th.

BOROUGH POLYTECHNIC.—*Electrical Engineering Department.*—The new department opens on Monday, September 23rd. Part-time day courses in electrical engineering, evening courses in electrical engineering and electrical installation work, telegraphy, telephony, automatic telephony, radio communication and physics, special courses on lift erection, electrical equipment of motor vehicles, jointing, and economics of telephone engineering. Prospectus on application to the Principal, (See our advertisement pages to-day.)

LONDON COUNTY COUNCIL.—Enrolment week for the 1929-30 session of day and evening classes in London began on September 16th. An exceptional number of applications to join has already been received, and it seems likely that the high attendances recorded in recent years will be surpassed. The past year created a record in the number of new buildings constructed for the development of technical education in London. The number of students who enrolled at evening classes last session was the highest ever recorded, and was accompanied by a record attendance. London has now 240 institutions for evening study, of which 47 have over one thousand students each; they are :—

Institute.	No.
Technical institutes and schools of arts and crafts ...	38
Polytechnics	8
Commercial institutes	46
Men's institutes	17
Women's Institutes	38
Literary institutes	13
Institutes of a general or special type	80
Total	240

The least satisfactory feature of the attendance statistics is the neglect, comparatively speaking, of boys who have just left school to take advantage of the facilities for technical training. In later life they enrol in considerable numbers, but in the meantime they have lost the habit of learning easily.

Appointments Vacant.

Demonstrator in electrical engineering for the City and Guilds (Engineering) College. Assistant mains superintendent (£273) for the Eccles Corporation Electricity Department. Mains engineer for Southend-on-Sea Corporation. Plumber-jointers for Stockport Corporation. Electrical assistant for Tunbridge Wells Corporation. (See our advertisement pages to-day.)

The Shannon Scheme.

At the sitting of the Irish municipal authorities in Cork on September 11th inst., strong exception was taken to basing charges for electricity supplied by the Shannon scheme on valuation instead of on the consumption per kWh. The Mayor of Clonmel, who presided, proposed that the charges for electricity should be based on the electricity consumed, and not on the valuation. The charge on the basis of valuation was not equitable, because the valuation varied very much in the different towns and cities. There was a certain element of coercion in the system adopted by the Electricity Supply Board. Mr. T. D. Donnelly (Waterford) said that if the Electricity Board was going to ignore the wishes of the people, the Shannon scheme had no hope of success. In the city of Waterford hundreds of people had their houses wired, but when they heard the basis of the proposed charges they decided to let those installations go by default. The chairman of the Rathmines Urban Council urged that the public should be supplied with electricity either on a flat rate or on the valuation system. Dublin City made a large profit in its electrical undertakings, and Rathmines made a very considerable profit, and they had been able to reduce the rate of charging in the last few years. They were all desirous of the success of the Shannon scheme, but it could only be successful by having behind it the goodwill and the co-operation and good wishes of the consumers. Mr. Forsyth (Pembroke) said the cost of the undertaking should not be charged to the Central Fund. That would be unfair to the taxpayers in general. The consumers of electricity should pay the costs of the service. A resolution was passed unanimously asking for the alternative system of payment according to the wishes of the consumers, and the fixing of a uniform charge per lamp for public lighting.

The Training of Maritime Wireless Operators.

Amongst the latest equipments with which the Dublin technical schools have been furnished is a completely new wireless-telegraph installation, consisting of two new transmitters and direction-finding apparatus, all of which are 1929 models, and are being used for the training of ships' wireless operators. A student of the schools having completed the course of training, is examined by an officer of the Ministry for Posts and Telegraphs and, if successful, obtains a Government certificate.

Overhead Lines Inquiry at Eastbourne.

A Ministry of Transport inquiry was held on September 11th and 12th at the Town Hall, Eastbourne, into the objections of fifteen local authorities and other bodies to the proposed south-eastern scheme of the Electricity Supply Board, which affects an area of 9,000 sq. miles and involves the erection of overhead lines across the Sussex downlands from Brighton to Eastbourne and on to Hastings. It was stated by Mr. O. L. Sherrard, who appeared for the Board, that the proposed line would be 43 miles in length, carried on steel towers 80 ft. high at intervals of 300 yards. The number of towers required would be about 235-79 from Brighton to Lewes, 85 from Lewes to Eastbourne, and 121 from Eastbourne to Hastings. The estimate for the original scheme prepared by the Electricity Commissioners was £76,000, but this was thought to interfere too much with local amenities, and a new scheme was prepared, which would cost £82,000. A suggestion had been made that the route of the line should be carried north through the Weald, but such an alteration would increase the cost by 63 per cent., and the local authorities and landowners of the Weald were no more likely to be favourably disposed towards the scheme. After paying every possible respect to the objections raised, the final scheme of the Board would cost £96,000. A letter had been received by the Board from the Society of Sussex Downsmen, stating that it considered that if it was absolutely essential for the line to cross the Downs the scheme proposed to them appeared to be the one least open to objection. Mr. Sherrard said that he thought some distinction should be drawn between the opposition of local authorities and of landowners with regard to the Board's electricity schemes. The Board was of the opinion that local authorities would have treated the schemes from a national rather than a local point of view, but their attitude in this respect had been disappointing. The landowners, however, had shown themselves extremely responsive to the Board's appeal concerning this particular scheme. Opposition had been withdrawn by the local authorities of Brighton, Hastings, Portslade, Newhaven, and Southwick, and appearances at this inquiry were only made by the East Sussex County Council, the Corporations of Hove and Eastbourne, and the local authorities of the rural districts of Chailey and Cuckfield. Objections to the towers and transmission lines were difficult to overcome, as no specific reasons were given why they were so objectionable. In fact, Sir Reginald Blomfield, the eminent architect, who had been consulted by the Board, said that the towers would be well proportioned and as such would be restful to the eye. It was stated that carrying the lines underground would increase the cost 7½ times. The town clerk of Eastbourne said that the Corporation had spent £100,000 on preserving the beauty of the Downs and was consequently opposed to the erection of unsightly towers or masts. Also the Eastbourne Corporation would, if sanction to the loan for increasing its own electricity plant were granted, undertake to supply outlying parishes without the agency of unsightly masts. The chairman of the Eastbourne Corporation Electricity Committee said, however, that if the opposition of the Corporation were likely to imperil the supply of electricity, whether local or national, it would be withdrawn. For the East Sussex County Council, it was stated that the towers would injure the amenities of the residential parts of the district and that the lines could just as well be carried underground. It was stated for the Brighton Corporation that, if the Ministry of Transport decided that the Board had made out its case, the line was as good as could be hoped for. The hon. secretary of the Downs Preservation Committee stated that that body did not want the scheme, but that, if it was inevitable, a route had been agreed upon which would maintain the Downs in their present agricultural state and would prevent their disfigurement. The representative of the Central Landowners' Association declared that the value of the land in the vicinity would depreciate.

West Float Dock Bridge, Birkenhead.

We understand that the first electrically-operated vascular bridge over the River Mersey is expected to be completed in about 18 months' time. The cost is estimated at £43,794.

The bridge will be of the Scherzer rolling lift type similar to the Queensferry bridge, though it will be much larger and will have a span of 100 ft. The roadway will be 23 ft. 6 in. wide with two rail tracks and there will be two foot paths, each 5 ft. wide on either side. The total weight, including ballast (750 tons), will be 1,100 tons.

The main driving gear will be mounted in an elevated machinery house built on trestles across the road on the Birkenhead side, the distance between the inner trestles being 37 ft. The two driving motors for lifting and lowering the bridge will have a capacity of 45 h.p. and the electric supply from Birkenhead Corporation will be 3-phase, 400 volts, 50 cycles. The times required for operating the gear for opening and closing the bridge will be:—

(*a*) Electric power and high-gear against light wind 1¼ minutes;

(*b*) Electric power and low-gear against high wind, 6 minutes.

The electric motors may be used singly or together as required.

The bridge will also be equipped with hydraulic energy for use in case of emergency. There will be a screwdown brake mounted on the differential pinion shaft, and this brake will have a holding capacity equal to a wind pressure of 40 lb. to the square foot on the fully open span. There will also be two contactor operated brakes.

Aluminium Paint and Factory Lighting.

Without any increase of glass areas or changes in their arrangement, added intensity of light sources or re-arrangement of lighting fixtures, better natural illumination of one of the large foundry buildings of the General Electric Company, of Erie, Pa., has been secured through the use of aluminium paint. Only one coat, which was considered the equivalent of two coats of oil paint, was used, and this was sprayed on. The cost of application was 48 per cent. of that of an equivalent pigmented surface, and since refinishing will have to be done at less frequent intervals, further savings are possible through reduced painting costs and avoidance of interference with production work. An added advantage of the aluminium paint is that it is highly resistant to lacquer fumes that are released in the shop, which is used for the construction and assembly of domestic electric refrigerators.

The British Association.

Corrections.—Two errors in our Special Commissioner's report of the meeting of the British Association for the Advancement of Science in South Africa need correction. On page 369, August 30th issue, the name of the Recorder should have been Mr. J. S. Wilson (not Wicken), and on page 434, September 13th issue, the load factor on the Rand should have been 70 per cent. (not 7).

Institution Notes.

Institution of Engineers and Shipbuilders.

The opening general meeting of the forty-sixth session (1929-30) of the North-East Coast Institution of Engineers and Shipbuilders will be held on the evening of October 18th, when Mr. Launcelot E. Smith, C.B.E., will be installed as President and will deliver an address. The Tees-side branch's opening meeting will be held on October 24th.

Institute of Metals.

At the invitation of the German Institute of Metals, the British Institute of Metals held its annual congress at Dusseldorf from September 9th to 12th. A number of papers on the latest developments in the theory and practice of metallurgy were read by English and German metallurgists. Dr. A. G. C. Gwyer gave the opening lecture, in which he dealt with the results of recent investigations upon aluminium and aluminium alloys. The object of the recent research work on this subject had been, he said, to improve the general reliability of aluminium and its alloys, more particularly as regards soundness and resistance to corrosion. The heat treatment of aluminium alloys had made great strides, while the application of the methods of X-ray spectography to aluminium was likely to yield very valuable and practical results in the near future.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Bury St. Edmunds Town Council has increased the salary of the borough electrical engineer, Mr. A. E. Knights, by £100 per annum.

The Aylesbury Town Council has appointed Mr. C. Vodden, of Gelligaer, as mains assistant at a salary of £4 per week, rising to £4 10s. after six months' service, and Mr. F. A. Lovell as consumers' assistant at a salary of £4 5s. per week.

The Irish Free State Electricity Supply Board has appointed Mr. Theodore Strand as chief operation engineer, for the Shannon scheme, and Mr. Berggren as station superintendent at the Ardnacrusha station. These two engineers, who have come from the Swedish Waterfalls Board, will hold the positions for two years, when Irish engineers will take their places. The Board has appointed Mr. T. P. O'Connor assistant chief operation engineer. Mr. O'Connor was for nine years chief electrical engineer at the Ford works in Cork.

The General Electric Co., Ltd., announces that Mr. H. Wynne Roberts, sales manager of the company, and Mr. F. Winstanley, manager of the Illuminating and Domestic Appliances Departments, have been appointed directors of the company. Both Mr. Roberts and Mr. Winstanley joined the G.E.C. after leaving college, and have had some 30 years' service with the company, rising by stages to positions of great responsibility. Mr. Roberts joined the G.E.C. in 1901, at the age of 17. He was appointed London sales manager in 1918. Mr. Roberts has always been intimately connected with the welfare and social activities of the company. He has been a member of the Sick Fund Committee for 21 years and of the Pension Fund Committee since the first general meeting. He is vice-chairman of the Social and Athletic Club, and in earlier days took a prominent part in G.E.C. athletics. He has been a member of the Board of the National Register of Electrical Installation Contractors from the date of its foundation. Mr. Winstanley joined the Manchester branch of the G.E.C. in 1898, at the age of 15. He came to London in 1919. He is chairman of the Electric Light Fittings Association, and was nominated by that body as a member of the Statutory Committee under the Electricity Supply Act.

At Blackburn, on September 10th, Mr. John G. Robinson was married to Miss Doris Heard, of Wiltshire. The bridegroom is a member of the staff of the Blackburn Electricity Department, whose wedding gift was a timepiece.

The marriage took place on August 31st, at Christ Church, New Malden, of Mr. Percival John Higgs, A.M.I.E.E., of Plymouth, and Miss A. L. Madgwick, of New Malden.

The Times states that Mr. James Fraser, Chief Commissioner of Railways and Tramways in New South Wales since 1917, has resigned owing to ill-health.

Sir Austen Chamberlain and Sir L. Worthington-Evans have joined the board of the Greater London & Counties Trust, Ltd.

The Wellington correspondent of *The Times* reports that a cordial welcome was recently given to Mr. L. A. Paish, the new British Trade Commissioner in New Zealand, and formerly Assistant Director of the Department of Overseas Trade. Speaking at a luncheon given by the United Kingdom Manufacturers' Association, Mr. Paish emphasised the progress made in the reorganisation of British industry, and said that there was a bright outlook for the future. He hoped to assist New Zealand trade by removing misunderstanding as to the attitude of British manufacturers towards Dominion markets.

Capt. R. C. Petter (Petters, Ltd.) left London on September 12th by the *Almeda Star* for Buenos Aires, from whence he intends to make a tour of South America and the West Indies. He will touch at Rio de Janeiro, and after three weeks in Argentina he will proceed to Valparaiso (Chile), Lima (Peru), Ecuador, Venezuela, Trinidad, British Guiana, Barbados, and probably Jamaica.

It was announced this week that Captain P. P. Eckersley, who is relinquishing the position of chief engineer to the British Broadcasting Corporation, is taking up an important position with the Gramophone Co. (His Master's Voice) next month. He will be concerned with the electrical section of the company's organisation, including radio work.

The Amalgamated Engineering Union *Journal* for September announces that Mr. J. T. Brownlie, the president of the Union, is to retire in June next year.

We are informed that as a result of the recent inquiry regarding the Blackburn undertaking, Mr. A. W. GOODWIN, a staff member for 27 years, has entered a new sphere of life, and his friends will find him at the Adelphi Hotel, Burnley.

Obituary.—SIR JOHN M. GATTI.—We deeply regret to record that Sir John Morice Gatti died suddenly on Saturday last of heart failure while playing golf. Sir John was the chairman of the Charing Cross Electricity Supply Co., Ltd., and the president of the British Electrical Development Association, 1928-29. He was born in 1872, and after passing through Stonyhurst College and St. John's, Oxford, was called to the bar of the Inner Temple. He had for many years taken a keen interest in London's affairs. In 1911-12 he was Mayor of Westminster and was chairman of the London County Council in 1927-28. As a member of the L.C.C. he was particularly interested in transport and electricity matters. He was very active during the passage through Parliament of the Bills for the co-ordination of London passenger transport, which the present Government decided not to proceed with. Sir John was knighted last year in recognition of his public services. We extend our sympathy to Lady Gatti and family in their loss.

An inquest was held on Monday last, when a doctor stated that Sir John's heart was in a bad state. A verdict of "Death from "natural causes" was returned. The funeral took place at Kensal Green on Wednesday last.

MR. H. G. WHITING.—The *Daily Mail* reports that Mr. Henry G. Whiting, manager of the Cork Electric Tramways Co., was drowned on September 8th while bathing in the vicinity of Cork.

MR. H. G. TRUST.—*The Times* reports the death on August 26th, at Rio de Janeiro, suddenly, of Mr. Humphrey Gerrans Trust, A.M.I.E.E., A.M.I.Mech.E., Mem.A.I.E.E.

Keystone View Co.] [*London*

The late Sir John M. Gatti.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Arun Electrical Supplies, Ltd.—Private company. Registered September 11th. Capital, £100 in £1 shares. Objects:—To acquire the business of a supplier, fitter, and repairer of and dealer in electrical fittings, fixtures, apparatus, wires, lamps and other articles to be used as means of employing electrical power carried on by W. L. Sibley as Arun Electrical Supplies at 15, Queen Street, Arundel, together with the stock-in-trade, fittings, and benefit of tenancies, contracts, &c., in connection therewith. The first directors are:—Sybil D. Whitehead, address not stated; D. Napier-Whittingham, 1, Palliser Court, W.14, electrical engineer; A. L. Wort, Sesco House, Duke Street, Littlehampton, electrical engineer. D. Napier-Whittingham is managing director. Secretary: Sybil D. Whitehead. Registered office: 7, Hanover Square, W.1.

John Richards & Co. (Longton), Ltd.—Private company. Registered September 11th. Capital, £1,500 in £1 shares. Objects:—To acquire the business of an electrical engineer and wireless dealer until recently carried on by J. Richards at Longton, Stoke-on-Trent, as "John Richards & Co." The directors are:—J. Richards, Calton House, Calton, Stafford; J. E. Leak, "Lurone," Weston Coyney, Stoke-on-Trent. Registered office: Stafford House, Trentham Road, Longton, Stoke-on-Trent.

Craven Hydro-Electric Supply Co., Ltd.—Registered as a public company September 11th. Capital, £5,000 in £1 shares. Objects:—To carry on the business of an electric light and power company in all its branches. The minimum cash subscription is 7 shares. The first directors are:—C. E. Lowcock, "Woodlands," Settle, Yorks.; F. W. Lowcock, "Falls House," Linton, *via* Skipton, cotton manufacturer; E. K. Lowcock, "Falls View," Linton, *via* Skipton, cotton manufacturer. Secretary: F. W Lowcock. Registered office: Linton Mills, near Skipton, Yorks.

Whitehead's Electrical Inventions, Ltd.—Private company. Registered September 7th. Capital, £1,000 in £1 shares. Objects: To acquire patents, patent rights, *brevets d'invention*, licences, protections and concessions to manufacture and deal in machinery, plant, &c. The subscribers (each with one share) are: G. E. Whitehead, 38, Rhiwbina Hill, Cardiff, engineer; E. L. Chappell, Y Ddwy Onex, Rhiwbina, near Cardiff, estate developer; G. Williams, Bryndedwydd, Heath Park Avenue, Cardiff, builders' merchant. The first directors are to be appointed by the subscribers and shall be permanent. Solicitors: C. J. Hardwicke, 109, Queen Street, Cardiff.

Murphy Radio, Ltd.—Private company. Registered September 9th. Capital, £6,000 in £1 shares (500 10 per cent. cumulative preference and 5,500 ordinary). Objects: To acquire the business of a radio manufacturer now carried on by F. Murphy at Hyde Way, Welwyn Garden City, Herts., as "Murphy Radio." The directors are: F. Murphy (chairman and permanent director), Madron, Hendon Avenue, Finchley, N.3; Mrs. Hilda C. Murphy, same address; E. J. Power, 13, Waverley Grove, Hendon, N.W. Registered office: 62-4, Brook Street, W.1.

Gardner & Co. (Portsmouth), Ltd.—Private company. Registered September 13th. Capital, £1,000 in £1 shares. Objects:—To acquire the business of an electrical engineer and builder carried on by C. A. Gardner at Portsmouth, and to carry on the same and the business of manufacturers of, and dealers in electrical and other apparatus used in connection with wireless, &c. The subscribers (each with one share) are:—C. A. Gardner, "The Retreat," Hulbert Road, Bedhampton, Hants., electrical engineer and builder; C. B. Wann, 290, Fratton Road, Portsmouth, inventor-consultant. C. A. Gardner is permanent managing director. Registered office: The Building Site, Hulbert Road, Bedhampton.

Associated Electricity and Monoxide Gas Corporation, Ltd.—Registered as a public company September 6th. Capital, £200,000 in £1 shares. Objects:—To carry on the business of a light and power company in all its branches, and that of electrical engineers and manufacturers and maintainers of plant for the generation, accumulation, transmission and supply of electrical energy; to acquire and work all the patents referring to the "Reid process" for the economic production of carbon-monoxide gas for power and other purposes, to take over the undertakings of the three existing companies working the said process, namely:—Reid Power Development Co., Ltd., Reid Process, Ltd., and Cheap Electric Power Corporation, Ltd.; to sell patent producer gas plants (combined with lime kilns) either for use in chemical works or for supplying power to gas engines or for heating purposes, to grant licences to work, develop and exploit the "Reid process," &c. The subscribers (each with

one share) are:—A. Dickson, 127, Jerningham Road, New Cross, S.E., clerk; Mary E. C. Morgan, 20, Barkston Gardens, S.W.5, clerk; and five others. The first directors are to be appointed by the subscribers. Secretary: J. Murphy. Solicitors: Satchell, Chapple & Son, 167, Regent Street, W.1.

R. Darbyshire (Wholesale), Ltd.—This company, whose registration was recorded in our last issue, asks us to make it clear that its business will be purely of a wholesale nature; it will not engage in retail business.

Official Returns of Electrical Companies.

G. Davenport (Wireless), Ltd.—M. G. Jemmett, 30-32, Ludgate Hill, E.C.4, ceased to act as receiver or manager on August 31st, 1929.

Birmingham District Power and Traction Co., Ltd.—Capital, £700,000 in 250,000 preference and 450,000 ordinary shares of £1 each. Return dated June 12th, 1929. 146,846 preference and 412,934 ordinary shares taken up. £559,780 paid. Mortgages and charges, £244,131 9s. 9d.

British Electrical Instruments, Ltd.—Debenture dated August 30th, 1929, to secure £400, charged on the company's property, present and future, including uncalled capital. Holder: Mrs. A. E. Millward, 91, Chorlton Road, Brooks Bar, Manchester.

John Spencer, Ltd.—Capital, £75,000 in 10,000 preference and 5,000 ordinary shares of £5 each. Return dated May 7th, 1929. 10,000 preference and 1,027 ordinary shares taken up. £55,135 considered as paid. Mortgages and charges, £25,000.

Chamberlain & Hookham, Ltd.—Capital, £100,000 in 10,500 ordinary and 9,500 preference shares of £5 each. Return dated July 9th, 1929. 10,100 ordinary and 8,000 preference shares taken up. £36,990 paid on 100 ordinary and 7,298 preference shares. £53,510 considered as paid on 10,000 ordinary and 702 preference shares. Mortgages and charges, nil.

W. J. Furse & Co., Ltd.—Capital, £35,000 in 9,000 preference and 26,000 ordinary shares of £1 each. Return dated May 18th, 1929. 9,000 preference and 21,029 ordinary shares taken up. £10,735 paid on 10,735 ordinary shares. £19,294 considered as paid on 9,000 preference and 10,294 ordinary shares. Mortgages and charges, nil.

Grierson Ledway Co., Ltd.—G. Hannah, 115, Abbey Road, Barrow, ceased to act as receiver or manager on September 3rd, 1929.

Adelaide Electric Supply Co., Ltd.—Acknowledgment of indebtedness dated August 28th, 1929 (supplemental to trust deed dated June 11th, 1918, and deeds supplemented thereto), to secure "D" consolidated debenture stock for £250,000, making in all £1,500,000 charged on the company's undertaking in Australia (excluding dividend equalisation fund and uncalled capital). Trustees: Electric and General Investment Co., Ltd., Falcon House, Aldersgate Street, E.C.1.

Wood Electric Fittings Co., Ltd.—Capital, £10,000 in 5,000 preference and 5,000 ordinary shares of £1 each. Return dated May 7th, 1929. All shares taken up. £5,000 paid on 5,000 preference shares. £5,000 considered as paid on 5,000 ordinary shares. Mortgages and charges, nil.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated April 15th, 1929. 244 shares issued and fully paid up. Mortgages and charges, nil.

Tungstalite. Ltd.—Capital, £3,000 in £1 shares. Return dated April 3rd, 1929. All shares taken up. £2,700 paid. £300 considered as paid. Mortgages and charges, nil.

Thames Valley Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated May 2nd, 1929. All shares taken up. £50,000 paid. Mortgages and charges, nil.

Brompton & Kensington Electricity Supply Co., Ltd.—Capital, £400,000 in 100,000 preference and 300,000 ordinary shares of £1 each. Return dated April 25th, 1929. 7,450 preference and 351,016 shares taken up. £199,845 paid. £158,621 considered as paid. Mortgages and charges, nil. Return of allotments made up to May 23rd, 1929, shows a further 21,432 shares allotted as fully paid to trustees on account of superannuation fund.

Yeovil Electric Light & Power Co., Ltd.—Capital, £75,000 in £1 shares. Return dated May 27th, 1929. 65,000 shares taken up. £65,000 paid. Mortgages and charges, nil.

Mexican Hydro-Electric Development Syndicate, Ltd.—Particulars filed of £20,000 debentures and premium of 100 per cent. upon redemption authorised June 11th, 1929, the amount of the present issue being £3,950. Property charged: The company's undertaking and property, present and future, including uncalled capital (in priority to 50 debentures of £100 each A1 to A50, 16 debentures of £50 each B1 to B16, and 8 debentures of £25 each C1 to C8, amounting in the aggregate to £6,000).

Alliance Electrical Co., Ltd.—Capital, £10,000 in £1 shares. Return dated May 17th, 1929. 3,854 shares taken up. £1,927 paid (10s. per share). £1,927 considered as paid. Mortgages and charges, nil.

Exe Valley Electricity Co., Ltd.—Capital, £50,000 in 4,000 preference and 46,000 ordinary shares of £1 each. Return dated June 10th, 1929. 3,600 preference and 20,000 ordinary shares taken up. £23,300 paid on 3,600 preference and 19,700 ordinary shares. £300 considered as paid on 300 ordinary shares. Mortgages and charges, nil.

British Electrical Reproduction Co., Ltd.—R. L. Latimer, C.A., 4b, Frederick's Place, E.C., was appointed receiver and manager on September 6th, 1929, under powers contained in debenture dated November 29th, 1928.

City Notes.

Electramonic Co., Ltd.

The extraordinary meeting called by Mr. W. H. Sayers, the managing director, was held on Wednesday last week. Mr. Sayers occupied the chair and reviewed the circumstances which led to the calling of the meeting. (A *résumé* of statements made by the parties involved appeared in our last issue, p. 448.) He said that after some difficulty, a contract for the supply of cabinets was concluded in August, 1928, and it appeared that the company could carry on manufacturing. In the following month it was evident that there was a shortage of capital, and subsequently there was an increase in orders. Then "the bombshell had fallen." The trade concentrated on the sale of cheap and efficient portable sets, and the company had to set about designing one of these. It was impossible to commence manufacturing this set before January last, and the Christmas trade was therefore lost. In February he had made preliminary arrangements with another company for a working agreement, when Sir Philip Dawson produced a scheme with the Celestion Co. which, after opposition on the part of all the directors, was finally adopted. After dealing with the negotiations with regard to this scheme, Mr. Sayers said that the Celestion Co. had not fulfilled its undertaking to loan the company £20,000, which prevented it from proceeding with its work. In February the company was solvent to the extent of £10,997 locked up in stock and book debts. Sir Philip Dawson had stated that he (Mr. Sayers) had entered into heavy commitments and had continued expending funds without the approval of the board. He denied this, and asserted that the company's position was due to the non-receipt of the loan from the Celestion Co. Although he had handed over a large number of shares to the other directors and to the Celestion Co., he still held 4,750 preference and 11,900 deferred shares in his own name, while a large holding of his was in the bank's name against an overdraft which he obtained to assist the company. His wife and son also held 4,000 shares, which they had bought. He maintained that practically no business had been done since his suspension; he had been hampered continually and restricted in the performance of his duties. He proposed to call a meeting during the following week (this week) at which resolutions would be proposed calling on the directors to retire and forming a shareholders' protective committee. He would then place his resignation in that committee's hands, and if it desired, would carry on his duties. In conclusion, he maintained that the company had "the finest machine of its class in the world."

On the following day (September 12th) an extraordinary meeting called by the rest of the directors was held in London to consider a resolution providing for the voluntary liquidation of the company. At the request of the chairman (Sir Philip Dawson), Mr. W. H. Sayers made a statement, and then Sir Philip said that in his opinion and that of his co-directors it would be in the best interests of the shareholders to wind up the company with a view to subsequent reconstruction. The auditors reported a deficiency of more than £104,000. He explained that he had only continued as chairman on account of the arrangement with the Celestion Co., which he believed would enable the company to be reorganised and placed on a sound basis. A discussion took place, and when the resolution was put to the meeting it was rejected by a large majority. Sir Philip Dawson thereupon handed in his resignation and that of his co-directors, which was accepted.

A special meeting was then held by the shareholders, and a committee of six was appointed (including Mr. W. H. Sayers) to consider and advise upon the position of the company.

Edison Swan Electric Co., Ltd.

The annual meeting of this company was held on September 16th, Mr. C. F. Spencer (chairman) presiding. In presenting the report and accounts (*vide* ELECTRICAL REVIEW, September 13th, p. 449), the chairman said that the position of the company was a sound and healthy one. During the current year

they had agreed to extend their field of operation by taking over the merchandise business, other than lamps, of the British Thomson-Houston Co. In addition, they were taking over the merchandising business of the Hotpoint Electric Appliance Co., Ltd. Those two consolidations had been made and were in operation to-day. Further, towards the middle of next year they hoped to add to their activities the merchandising field of the Metropolitan-Vickers Co. This was a new field for the company to tackle, inasmuch as it meant considerable reorganisation of staff, of premises, and generally of the whole working of the undertakings. The report and accounts were adopted.

Burndept Wireless (1928), Ltd.

This company's first report was reviewed in our last issue, p. 448. The annual meeting took place on September 13th, when Mr. W. H. Lynas presided in the absence of the chairman, Mr. C. W. Rooke. Mr. Lynas read a speech which Mr. Rooke had prepared. This referred to the reorganisation of the Burndept business and to the handicap under which the company started owing to the continued control of the receiver and manager. That placed the company in a disadvantageous position in relation to last year's Radio Exhibition, although it was able to cope with a substantial portion of the orders which it received. Out of the profit of £15,978, a reserve was to be created, and the more intangible assets would be written down. During the current year additional factory accommodation had been erected at Blackheath, and this was already in service. The selling organisation had been extended throughout the country, and a valuable export connection was being developed. Effective steps had been taken to meet the extensive demands which the company anticipated.

Southern Brazil Electric Co., Ltd.

The report for the year ended December 31st last records a loss of £3,530, as compared with a profit of £9,055 for 1927. This is stated to be due mainly to the amount involved by the amortisation agreement in connection with the 6½ per cent. mortgage debentures. It is stated that the undertakings in which the company is interested continue to progress, but the company has been unable to obtain the municipal authorities' sanction to increased rates which are necessary in view of the depreciation of the Brazilian currency. The head office has been removed from London to Brazil, and the meeting is to be held there to-day (Friday).

Stock Exchange Notices.

Dealings in the following have been allowed by the Committee under Rule 159:—

Cables and Wireless.—£344,916 seven and a-half per cent. non-cumulative "A" ordinary stock; £198,083 "B" ordinary stock; £275,892 five and a-half per cent. cumulative preference stock.

Underground Electric Railways of London.—2,761 ordinary shares of £1 each, fully paid, Nos. 7,219,686 to 7,222,446.

Midland Electric Corporation for Power Distribution, Ltd.

An interim dividend of 2½ per cent. has been declared on the ordinary shares, as last year.

British Insulated Cables, Ltd.

An interim dividend of 5 per cent. (1s. per share) has been declared on the ordinary shares for the half-year to June 30th last. The dividend is payable on the 333,333 new shares which were issued as a bonus in April.

Eastern Telegraph Co., Ltd.

A dividend at the rate of 3½ per cent. per annum has been declared on the preference stock for the quarter ending September 30th.

Automatic Telephone Manufacturing Co., Ltd.

The directors have again declared an interim dividend of 3½ per cent. on the ordinary shares.

International Automatic Telephone Co., Ltd.

The interim ordinary dividend is 3½ per cent., as last year.

Hendon Electric Supply Co., Ltd.

An interim dividend of 5 per cent., free of tax, has been declared on the ordinary shares, as for 1928.

German Companies.

The directors of the *Rheydt Cable Works Co.* recommend a dividend of 12 per cent. for 1928-29, as in the previous year.

The *Aix-la-Chapelle Electricity Works Co.* (*Garbe, Lahmeyer & Co.*), which paid no dividend for 1927-28, proposes to carry forward the profits earned in the past year to strengthen the position of the company.

Swiss Company.

Bank für Elektrische Unternehmungen, Zurich.—Including a balance of 377,000 fr. brought forward, there was a net profit of 9,789,000 fr. for 1928, as compared with 9,656,000 fr. in the previous year. The dividend remains at 10 per cent.

Stocks and Shares.

TUESDAY EVENING.

THE markets of the Stock Exchange hang upon the outlook for money. With the end of the holiday season practically at hand, business in securities should be showing expansion, but with the possibility of a rise in the Bank Rate, it is natural enough that the public should hang back, desirous rather of seeing what is going to happen in the near future than of buying and selling shares at this particular juncture. Earlier in the month, it was taken for granted that there would be a rise in the Bank Rate to 6 per cent.—or, some said, to 6½ per cent. At the present time, the chances are thought to be against alteration in the Rate. It is the uncertainty which weighs upon business, though its effect is, comparatively, speaking, slight. A good deal of the previous anxiety has worn off, in consequence of the idea of a rise in the Bank Rate having become familiar to those whom it would concern. The gilt-edged stocks are very firm, and, in sympathy with these, such issues as Central Electricity 4 per cent. debenture and others of this nature are showing a better tendency.

Perak Hydro-Electric.

Perak Hydro-Electric ordinary shares, which were down to 14s. 9d. a month or two ago, have recovered to 16s. upon mail advices which show the damage done to the machinery by flood to have been of less consequence than it was feared would prove to be the case when the news was first received. The price of the 7 per cent. debentures has recovered from 107½, at which it stood towards the end of August, to 113. It is proposed, of course, to make a new issue of these convertible debentures upon terms that have not yet been disclosed, but which are likely to involve a modest bonus to holders who care to put up the extra money required.

Home Railway Stocks.

The Home Railway market has halted in its stride. After a fairly breathless rise in prices for a fortnight, the temper of the market became more cautious, and, in the absence of fresh support, a reaction took place. This may have been due to profit-snatching, or it may have been caused by a little nervousness in regard to the meeting, fixed for next week, at which the companies are to discuss with the men the question of reinstating the wage-reduction of 2½ per cent. Amongst the Tube stocks, a point fall, to 110, occurred in the income bonds of the Underground Railways of London. The shares eased off to 23s. Metropolitan consolidated is lower at 60½. Amongst the Tramway issues, London United 4 per cent. debenture has been marked down 3½ to 51½, business being done at 50. London and Suburban Traction ordinary are lowered to half-a-crown, and the preference, nominally unaltered at 10s. middle, can be bought at that price or less.

Electricity Supply.

Electricity supply shares show a good deal of strength. A number of prices were quoted ex dividend at the last Stock Exchange Account Day, September 12th, and the deductions were recovered in nearly every case. These are, of course, in respect of the interim payments; the announcements were published in the ELECTRICAL REVIEW as they were announced by the companies. Metropolitan Electric ordinary continue to be an outstanding feature of activity. The price is 1s. 9d. higher at 47s. 6d. Charing Cross ordinary have improved to 26s. 6d. Notting Hill Electric 4 per cent. debenture advanced to 92½. Isle of Thanet advanced to 40s., the preference remaining at 28s. The strength of the former is due to rumours, for which there seems to be some foundation in fact, that the company is the object of desire to one of the bigger undertakings, amongst which the County of London appears to be the most obvious, having regard to the geographical position of the Isle of Thanet Company. Egham and Staines, which had a sharp rise last week, are a little easier at 39s., North Metropolitans, which rose 1s. 6d. a week ago, to 53s. 6d., are now up to 57s. 6d. Bournemouth and Poole have recovered to 68s. 9d. Oxford Electrics are 27s. 6d.

Greater London and Counties.

The Earl of Birkenhead and Sir Harry McGowan left London last week for New York. Lord Birkenhead, who is, of course, the chairman of the Greater London and Counties Trust, said he was visiting the States principally in connection with the Utilities Power and Light Corporation. The latter is the company which controls the Greater London and Counties Trust, of which Sir Austen Chamberlain and Sir Laming Worthington-Evans have recently become directors. Sir Austen Chamberlain stated in an interview that the Trust is concerned in controlling a number of the power making and distributing companies, the direction of which is now centralised so as to give a better service to the consumer, as well as aiming at better profits for the enterprise. The visit of Lord Birkenhead to the States is expected to be fraught with important consequences to the companies connected with the electric power and utility industries.

Shares on Offer.

It may be of service to mention that there are 1,500 Kensington and Knightsbridge Electric ordinary shares on offer

in the market at 28s., at which price the yield on the money is £6 2s. 9d. per cent. until 1931. There can also be obtained 1,000 London Electric Supply Corporation ordinary at 28s., which, until 1931, return £6 8s. 6d. per cent.—assuming, of course, that the dividends in both the last-named cases are maintained at the rates now being distributed. A few hundred Richmond (Surrey) Electric ordinary are available at 45s., these paying a little under 5 per cent. on the money, and 500 Urban Electric ordinary at 38s. 6d. offer, at the moment, a return of £3 12s. 9d. per cent. About 3,000 St. James' & Pall Mall Electric ordinary may be obtained at 26s. 3d., the yield here being £6 0s. 3d. until 1931. Chiswick Electric Supply ordinary, of which 500 are offered at 83, pay £5 6s. 6d., and 1,000 Electric Supply Corporation ordinary, available at 54s., give £4 1s. 6d. per cent.

Cables and Wireless.

Cables and Wireless "B" ordinary stock has further recovered to 70, showing a gain of two points on the week, and the company's 7½ per cent. "A" ordinary stock, at 84½, is similarly better. There has been a demand, too, for the 5½ per cent. preference, raising the price to 95½. This latter stock is becoming scarce, for, as already pointed out here, a good many holders of the Eastern Cable group sold their "B" stock when the partition took place, and invested the money in Cables and Wireless 5½ per cent. preference as being a safe and reasonably-priced security. It is not unreasonable to look for an improvement to the neighbourhood of 100, as soon as the money outlook becomes a little less obscure. The "A" ordinary stock—now that people have fairly faced the possibility that, in the first year of the Cable and Wireless working, the dividend on this issue may be no more than 5 per cent.—is again coming into more favourable consideration on the part, particularly, of those investors who look two or three years ahead. Amongst other cable stocks no particular movements have occurred. Automatic Telephones are better at 38s. 9d. Telephone Manufacturing shares have fallen to 4s. American Telephone & Telegraph, at 300, is unchanged; and Internationals, at 140, have shed 4½ points. Sofina, interest in which was recently revived, reached to 3 15/16, after having been 4½.

Strength of Cable Constructions.

Amongst the manufacturing and equipment companies' shares, Enfields stand out with a rise to 5, the buying being based on expectations, referred to in this column on several previous occasions, that there may be a bonus issue of shares before very long. The market as a whole is strong, the announcement made by the Central Electricity Board that it is about to spend £800,000 in electrical equipment, &c., having a good effect. Moreover, the committee that the Government has appointed to consider electrification of main-line railways is held to contain a hint of possible further expansion on the large scale. British Insulated are 3/16 better at 78s. 9d., the interim dividend being the same as that of a year ago, when, however, the capital was considerably less than it is now. Callenders and Henleys are decidedly better. Brush Electric ordinary continues dull, being no better than 131, at which the return on the money, on the basis of the 10 per cent. recently paid, comes to over 7½ per cent. G.E.C. ordinary are neglected, and a fall of 3/16ths lowered the price to 2⅞, while Associated Electric ordinary shares weakened to 2¼. Crompton Parkinson ordinary rose 4s. to 26s. 6d. Johnson & Phillips kept steady at 2.

Hydro-Electrics' Value.

Hydro-Electrics have again been a centre of interest, the present price of 83½ showing a gain of 3½ points on the week. The company has lately become associated with several of the best-known concerns in America, and together they have formed the United States Electric Power Corporation. On paper, Hydro-Electrics work out as being worth about 105, taking the prices of the company's holdings, in the various undertakings with which it is connected, at their current market value, and, although this may be regarded as a very rough-and-ready method of reckoning—one, also, which may prove to be misleading—it is the only manner whereby the price of shares in a holding company can be valued. International Holdings shares are a dull market at 13, being neglected in favour of Hydros.

Montreal Light & Power at 155 are 5 down on the week, Shawinigan have lost 4 to 105, and Mexico Tramways, after being over 60, reverted to 59. Mexican Light and Power Company hold their considerable gain at 123½, and the company's 7 per cent. preferred shares at 84½ are up 3 points. Pennsylvania Water common shares are a little lower than they have been at 103½. Canadian General Electric remain strong at 410.

Miscellaneous.

Shares in engineering and allied companies are inclined to be heavy by reason of the outlook for possible trouble in the coal trade. Babcock & Wilcox have given way to 3½, Vickers are easier at 9s. 6d. The tendency as a whole has been towards slightly lower levels. The rubber share market, on the other hand, is inclined to firm up, but there is next to nothing doing except in a few of the leading companies' shares. Baird International Televisions attracted a little notice at 9s., on the B.B.C. announcement that experimental broadcasting of the Baird system would begin on the last day of this month.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1927.	1928.	Price Sept. 17 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	68/9	+1/16	4 7 8
Brompton Ordinary	1	8½	8½	26/-	—	5 7 8
Charing Cross Ordinary	1	8½	8½	26/6	+6d.	5 5 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	25/-xd	—	5 12 0
City of London	1	10	10	32/-xd	—	4 7 6
do. do. 6% Pref.	1	6	6	23/-xd	+6d.	5 4 4
Clyde Valley	1	8	8	26/3xd	+6d.	... ...
County of London	1	7	10	57/6xd	+6d.	3 9 9
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	39/3	—	4 2 8
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	28/6	—	5 5 2
London Electric	1	8½	9	27/6	—	5 1 10
Metropolitan	1	9	9	47/6	+1/9	3 16 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	6½	24/6	—	3 15 4
Mid. Elec. Power	1	15	8	36/3	—	4 8 2
Newcastle-on-Tyne Ordinary	1	6	6	27/-	—	4 9 0
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	25/-	—	5 4 4
St. James' and Pall Mall	1	8	8	26/6	—	5 5 8
Scottish Power	1	8	8	32/-	—	5 0 0
South London	1	8½	8½	26/6xd	+6d.	5 5 8
Urban Ordinary	1	7	7	38/3	—	3 13 6
Westminster Ordinary	1	8½	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	35/-	—	6 0 0
Yorkshire Elec.	1	8	8	26/6	—	4 7 8

HOME RAILS.

Central London Ord. Assented	Stock	4	4	71	—	5 12 8
Metropolitan	"	8	8½	60½	-½	5 15 9
do. District	"	4	5	72½	—	6 18 0
Underground Electric	£1	5	7	23/-	-6d.	6 1 8
do. do. Income	Bonds	6	6	110	-1	5 9 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	108	—	5 16 6
do. Def.	"	1½	1½	24¾	—	6 4 6
Automatic Telephone	1	10	12½	38/9	-6d.	6 8 10
Cables & Wireless 5½ Pref.	Stock	—	—	95½	+½	5 15 2
do. A 7½ Ord.	"	—	—	84½	+2	... ...
do. B Ord.	"	—	—	70	+2	... ...
Globe Tel. and T. Ord.	10	10	10	25½	—	*3 18 6
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	20	17½	31	—	5 13 0
Indo-European	25	10	10	47½	—	*5 5 8
Marconi-Marine	1	12½	15	3	—	5 0 0
Oriental Telephone Ord	1	12	12	3	—	... ...

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	8 7/16	—	8 0 0
do. do. 2nd Pref.	5	6	6	8⅝	—	8 17 10
do. do. 5% Deb.	Stock	5	5	74½	—	6 14 8
British Electric Traction Def. Ord.	"	5	5	1650	—	... ...
do. do. Pref. Ord.	"	8	8	128	—	6 5 0
Brazil Traction	100	7	8	70	—	2 17 2
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	50½	—	5 10 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/-	—	... ...
London United Tram Deb.	Stock	4	4	51½	-9d.	7 15 4
Mexico Trams, 5% Bonds	—	5	5	75½	—	6 12 5
Mexican Light Common	100	Nil	Nil	123½	—	... ...
do. 7% Pref.	100	7	7	84½	+3	8 5 8
do. 1st Bonds	—	5	5	78	—	6 12 5
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	—	2½	—1/16	3 13 4
Babcock & Wilcox	1	13	15	65/-	—1/16	*4 12 4
British Aluminium Ord.	1	10	10	51/3	—	*3 18 0
British Elec. Transformer Pref.	1	7	7	13/-	-9d.	... ...
British Insulated Ord.	1	15	15	3 15/16	+1/16	3 16 2
Brush Ord.	Stock	10	10	131	—	7 12 8
Callenders	1	15	15	3 15/16	+1/16	3 16 2
do. 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Ord.	5/-	1	—	26/6	+4/-	... ...
do. 8% Pref.	1	8	—	25/-	—	6 9 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	6½	15/-	—	7 6 8
Enfield Cable Ord.	1	20	20	5	+½	4 0 0
English Electric	1	Nil	Nil	8/9	—	... ...
do. do. Pref.	1	8	Nil	9/6	—	... ...
Gen. Elec. Pref.	1	6¾	6¾	24/-	—	5 8 4
do. Ord.	1	10	10	2¾	-1/16	3 9 8
Henley	1	25	30	6⅞	+⅛	4 11 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	Nil	Nil	12/6	—	... ...
Johnson & Phillips	1	10	—	2	—	5 0 0
Siemens Ord.	1	7½	7½	28/9	—	5 4 4
Telegraph Construction	12	10	10	23	—	5 4 2

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during August.

DURING August, according to the Board of Trade returns, electrical exports were slightly above the average, while imports reached a record level, going well beyond the £700,000 mark, which they have never reached before.

Turning to the exports, it will be observed that the total value was only slightly below that of July last, but £242,356 above the August, 1928, figure. As compared with July, there was an increase of £62,490 in the value of exports of submarine telegraph and telephone cable and another of £23,294 in the case of unenumerated machinery. The latter rise was balanced by decreases in the other two items in the machinery section. The greatest decrease occurred in telegraph and telephone instruments and apparatus. There were some very substantial increases as compared with August, 1928, the greatest being one of £87,494 in the case of telegraph and telephone equipment. All three cable items manifested large increases, that in the case of insulated wires and cables (£73,585) being particularly worthy of note. The machinery exports fell in value by about £60,000, and glow lamps showed a decline of half this amount.

The rise in imports appears to have been due mainly to the increased imports of telegraph and telephone apparatus. These advanced by £89,840 as compared with July and £125,323 as compared with August last year. It is probable that a great deal of radio equipment, imported in anticipation of the winter season, is included in the figure. There were also greater imports of glow lamps, machinery, unenumerated goods, and batteries and accumulators.

While it is satisfactory to note that so far this year exports have risen in value by over half a million sterling, this satisfaction is somewhat tempered by the consideration that imports have shown an advance of £773,000.

The following table analyses our electrical machinery exports according to their destinations, the figures for August and the corresponding month of 1928 being compared:—

Destination.	Aug., 1928.	Aug., 1929.	Inc. or dec.
	£	£	£
European countries ...	95,833	80,273	−15,560
Japan	21,456	11,267	−10,189
South America ...	79,757	61,868	−17,889
South Africa	25,944	37,322	+11,378
British India	155,129	101,498	−53,631
Australia	84,370	83,306	− 1,064
New Zealand	20,902	36,295	+15,393
Canada	15,993	30,552	+14,559
Other countries ...	75,920	73,035	− 2,885
Totals ...	£575,304	£515,416	−£59,888

It may be mentioned that, although the value of machinery exports declined by over 10 per cent., the decrease in the weight of these exports was only 6.3 per cent. In the case of European countries the weight actually rose by over 9 per cent., although the value was 16 per cent. lower. This phenomenon was even more pronounced in the case of British India, in which the weight of exports increased by about 13 per cent., while their value declined by over 34 per cent. On the other hand, exports to New Zealand declined in weight while increasing in value. In the first eight months of the year electrical machinery exports fell in value from £4,578,712 to £4,261,799, mainly on account of a large decline in exports to South America.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Aug., 1929.	Inc. or dec. as compared with July, 1929.	Inc. or dec. as compared with Aug., 1928.	Electrical imports for Aug., 1929.	Inc. or dec. as compared with July, 1929.	Inc. or dec. as compared with Aug., 1928.	Electrical re-exports for Aug., 1929.	Inc. or dec. as compared with July, 1929.	Inc. or dec. as compared with Aug., 1928.
Electrical goods and apparatus (unenumerated)	£264,903	− £14,116	+ £49,032	£160,824	+ £16,106	+ £16,802	£10,202	+ £1,456	+ £892
Insulated wires and cables ...	270,736	− 47,585	+ 73,585	72,270	− 3,774	− 1,157	736	+ 97	+ 27
Glow lamps	66,444	+ 6,487	+ 29,989	54,628	+ 20,401	+ 15,341	232	− 3,289	+ 2
Arc lamps and parts ...	607	− 4,735	− 104	1,490	+ 625	− 4,439	20	+ 13	+ 10
Batteries and accumulators ...	87,401	− 288	− 29,361	69,499	+ 6,627	+ 5,515	3,027	+ 1,106	+ 2,334
Meters and instruments ...	34,216	− 6,101	+ 2,777	21,248	− 5,015	− 486	711	+ 582	+ 386
Carbons	886	+ 549	+ 436	7,745	− 2,477	+ 1,526	207	+ 111	+ 139
Switchboards (not telegraph or telephone)	6,914	+ 2,239	− 2,881	—	−	—	15	+ 15	+ 15
Electrical Machinery—									
Electrical machinery (unenumerated)	336,006	+ 23,294	+ 9,924	177,671	+ 39,625	+ 18,325	7,310	− 2,306	− 752
Railway and tramway motors	17,735	− 15,489	− 5,810	—	—	—	—	—	—
Other motors and generators...	161,675	− 8,703	− 64,002	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	86,936	− 6,519	+ 36,026	2,261	− 2,741	− 4,448	2,040	+ 2,039	+ 2,040
Submarine telegraph and telephone cable	94,666	+ 62,490	+ 55,251	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	249,630	− 16,084	+ 87,494	180,650	+ 89,840	+ 125,323	5,765	− 2,253	+ 2,252
Totals	£1,678,755	− £24,561	+ £242,356	£748,286	+ £159,217	+ £172,302	£30,265	− £2,429	+ £7,345
	Exports			Imports			Re-Exports		
Inc. for eight months	+ £514,770			+ £773,367			+ £11,960		

Association of Public Lighting Engineers.

Annual Conference and Exhibition at Bournemouth.

(*Continued from page* 460.)

LAST week we gave a brief summary of the proceedings of the Conference. We now supplement that account by relating in greater detail some of the principal features of the various functions. In his civic welcome, the Mayor, Alderman C. H. Cartwright, referred to the importance of such gatherings in bringing together members of the same profession from all parts of the country. Delegates to the Conference had probably looked with a professional eye on the public lighting of Bournemouth to discover its capabilities. It might not fulfil all the ideals of lighting engineers, but he thought it would compare favourably with towns of similar populations, and in a garden city like Bournemouth the population was scattered over a wider area than in most towns. Thus, with a population of 100,000, Bournemouth had 135 miles of road to illuminate. It would be realised, therefore, that outside the main thoroughfares, it was practically impossible to instal such a brilliant system of lighting as might be found in many boroughs.

Mr. J. F. Colquhoun, thanked the Mayor for his warm welcome. He confessed that the delegates had looked at the public lighting of Bournemouth, and, frankly, they had been disappointed. They understood some of the difficulties the scattered population presented, but they hoped the Town Council of Bournemouth, stimulated by the presence of the present Conference, would give every possible assistance to their lighting superintendent, so that in the future it would not be necessary to explain why all the streets in beautiful Bournemouth were not well lighted.

Mr. Colquhoun then introduced the new president of the Association, Mr. S. B. Langlands, J.P., and mentioned that Mr. Langlands had been their first president, and that during his second period of office he would view with pride the continued growth in membership and in usefulness of the Association which he had nursed in its infancy.

He added that the Association had undoubtedly done a very great deal towards the improvement of public lighting throughout the country, and, because of the activities of the Association, the public conscience had been awakened to the need for better public lighting.

The president then delivered his address, which was followed by a paper on "Lighting and Rating" by ex-Bailie James MacDougall. Abstracts of these were given in the last issue of the Electrical Review (pp. 457-8).

The delegates were then entertained at luncheon in the Town Hall by the chairman and directors of the Bournemouth Gas & Water Co. The chairman of the company, Mr. Wm. Cash, is in New York as one of a deputation of chartered accountants to America, and in his absence the deputy chairman of the company, Lt.-Col. Sir Charles L. Morgan, presided. Welcoming the delegates, Sir Charles mentioned that there were present the Mayors of Bournemouth, Poole, Christchurch, Burnley, and Widnes, and two ex-Bailies of Glasgow.

He extended a hearty invitation to them to visit the company's gasworks and waterworks. So far as the gasworks were concerned they were not at the top of the first flight, but they were very nearly there, and at the instigation of their general manager he thought they had everything in the way of labour-saving devices and the latest appliances to enable them to fulfil their statutory obligations to their consumers in the best possible manner.

They were working side by side in the most friendly manner with the Bournemouth & Poole Electricity Supply Co. There was competition, but in a proper business spirit, and there was no reason for either to complain. He honestly held the conviction that there was room for both.

Mr. S. B. Langlands (president of the Association) said they were meeting in a glorious city, where they had received the warmest welcome and the kindliest hospitality.

Alluding to the happy relationship existing in Bournemouth between the Corporation and the Gas and Water Company, he said that public lighting must be a civic duty, but where they had the gas and water work done so well as it was in Bournemouth there was no need for the Corporation to tackle it.

In conclusion he expressed thanks to the company for its hospitality and said that as a lighting body they appreciated the splendid work being done in Bournemouth in connection with their profession.

Discussion on ex-Bailie James MacDougall's Paper.

A keen discussion on Mr. MacDougall's paper was opened by Mr. E. C. Lennox, of Newcastle, who pointed out that to-day the lighting of rural highways was quite as important as the lighting of towns and cities. Under the present system the lighting of those highways was left to the parish councils in many instances, and those small bodies had little money to spend upon it. He mentioned that in one particular area the rate for lighting was something like 9d. to 1s. in the £. He added that he had brought the matter forward in the hope that the Ministry concerned might be induced to consider some different method of rating for public lighting in those areas. It was unfair to the parishioners that they should have to meet an expense that was largely brought about by the increased traffic, over which they had no control. He thought the lighting of rural highways should be assisted by the Ministry of Transport out of the revenue received from motor taxation. Compared with the figure for the cities, a rural rate of 9d. to 1s. for public lighting was far too high. He suggested that it might be possible to collaborate with other associations, and arrange for lighting certain highways as demonstrations, as a means of arousing public interest in the matter.

Councillor Thraves, of Sheffield, urged that public lighting should be considered not only in the interests of reckless motorists, but also in the interests of the slum dwellers. He believed the Association would be doing sound social work if it improved the lighting in the courts and alleys of cities. In Sheffield it had been found that the better such places were lighted, the less was the work thrown upon those responsible for the good order of the city.

Mr. J. F. Colquhoun favoured public lighting being undertaken by the local authorities. He suggested that there was need for the improvement of public lighting in many parts of the country, if only because of the danger existing for motor traffic, and something in the nature of compulsion might have to be applied, even if the State had to come into it with the road fund. It would be to the advantage of local councils to consider whether, in the event of compulsory measures coming in, their lighting was so good that nothing would require to be done. He thought advantage should be taken of clock controllers, which certainly effected an economy in labour.

Mr. John Clark, of Aberdeen, thought the motorist might be asked to pay for his lighting, but he disapproved of raids upon the road fund for the purpose of general Exchequer requirements. He explained that in administering municipal finance, the relative importance of many different services had to be considered, but nowadays everything seemed to be becoming subordinate to public health.

Mr. T. Wilkie, of Leicester, suggested that the Association should tackle the question of a reduction in the price of gas as a means of getting better public lighting.

Mr. J. H. Clegg, of Burnley, said that in comparing prices between town and town, they should bear in mind the services involved. He mentioned the case of a mile of mains being used to supply seven lamps. With regard to the Utopian outlook of electricity at ¼d. a unit, when comparing that with Glasgow's 1¼d. a unit, he asked whether due regard was being paid to the big capital charge on mains.

Mr. G. Cowan, of Portsmouth, said that in that town they were gradually converting gas lighting into electric lighting. In the case of the ordinary street lamp the cost of gas lighting was slightly higher than electricity. They were making a considerable improvement by introducing central lighting in the main streets, and the system would probably be extended.

It was 25 to 30 per cent. better than having high-power arc lamp standards on the kerb. He thought, however, that for traffic purposes they did not get the distribution of light that they got from gas lighting.

Mr. DAVIS, of Chesterfield, suggested that when a saving was made by the lighting department, the money should not be put to the relief of rates, but should be devoted to public lighting.

Mr. A. C. CRAMB, of Croydon, said the time had come for the electrical and gas industries to do something towards the standardisation of prices. There could be no justification for some of the prices now charged.

Mr. C. H. HUGHES said there was no doubt public lighting could reduce a town's policing costs. With regard to electric lamps, he pointed out that there had recently been consistent price reductions since the figures appearing in Mr. MacDougall's paper, and there was no doubt that as standardisation of pressure and types came about prices would be still further reduced. Cheapness in America was due to some extent to the uniform voltage.

American Practice in Public Lighting.

By J. F. COLQUHOUN and E. J. STEWART, M.A., B.Sc.

(*Abstract.*)

The International Commission on Illumination forms the world authority for the discussion of problems of illumination, the co-ordination of research, and the preparation of definitions and international recommendations. It is constituted by National Illumination Committees from the leading nations, these committees being representative of official bodies concerned with illumination in each country. The plenary meeting is usually held trienially. That of 1928 took place in September at Saranac Inn, N.Y. Eleven countries were officially represented. Our intention is to stress some of the impressions of a street-lighting man visiting America.

Although there were, we learned, 3,000 traffic-control signals in New York, there were still many intersections controlled by police. There the street lamps were contributing practically nothing to the illumination of the street. We were told seriously that the New York Edison Company, which supplies the electricity for the street lighting of the city, had once intentionally left all the street lamps in Broadway unlighted for a week, and neither the city authorities nor, apparently, anyone else, had noticed any difference. The official street lighting of New York seemed to us poor. The streets beyond the range of the signs looked all the dingier.

The lamps seen were mostly magnetite arcs, which type is still largely used in American cities, although it is not now much installed anew; even the lamps already installed tend to be removed for gas-filled filament lamps. The light is white, rather cold, and, when not enclosed in diffusing glass, point-like and glaring. The clear globe is common in suburban highways, side streets, and lesser towns; but usually in important streets the arc is almost or quite concealed in an opal or rippled glass globe. White glassware was the prevailing practice in New York. There was relatively little glare.

The enclosure of filament lamps also in some form of ornamental and more or less diffusing glassware, especially opal, rippled, or "Novalux," we found to be general throughout America. The relative absence of glare in the street lights—as well as in interior lighting—struck our attention everywhere. This freedom from glare is an admirable feature, but we were of opinion that in many installations another essential for visibility, correct relation of candle-power, height, and spacing, had not been provided.

In the New York streets the principal fault appeared to be excessive spacing. The light did not get along from one lamp to the next, or even across the carriageway from one kerb to that opposite. These criticisms of excessive spacing apply to other American cities also, especially to streets other than the central main thoroughfares with "display" installations. The standards in New York were of somewhat ornamental design, slender and graceful.

Fifth Avenue is a high-class shopping street of which New Yorkers are particularly proud. It was rather free from advertising signs and showed some imposing buildings, not all skyscrapers. Its shop windows were well lighted, but had few "stunt" effects. Fifth Avenue was thus mainly dependent upon its official street lighting for illumination. There and in other important streets of the same district the arcs in their pear-shaped white globes were mounted in couples on the cross-arm of a rather tall steel pole. The height of the source above ground would be about 20 ft. Such supports, the tall pole, the scroll work, the bracket, and the pendant position of the lantern were rather uncommon in America, at any rate combined with ornamental fittings; their use was frequent in New York. More generally in American streets the "pole-top" unit had been adopted.

The spacing in Fifth Avenue was not over 150 ft., at some parts less. Even here, however, the illumination was hardly sufficient to reach satisfactorily across the centre-line of the wide carriageway; that is, to produce a good reflection from the surface there.

The signs for traffic control in Central Park, rotated by hand, were illuminated at night from above, and red and green signal lamps were also provided. Even in daylight the policeman stands out poorly against the background; in American cities, as in Britain, traffic controllers were inadequately illuminated by the regular street lighting, even where that appeared otherwise even extravagant. Headlights, we were informed, were prohibited in the centre of New York. In other cities of America we found it difficult to judge the lighting of many streets on account of the glare caused by bright lights of approaching automobiles.

The installations at Boston were generally similar to those seen in New York, but, we thought, had better spacing. Yet, owing to the very great width of many of the streets, the heights and spacings did not seem to allow proper reach of the illumination across the roadway.

A typical arrangement had pole-top lanterns, magnetite arcs or gasfilled (750-watt) lamps, in urn-shaped opal or rippled glass under metal covers, mounted opposite on special standards, at a height of about 16 to 20 ft., and spaced about 100 ft. apart. This gave beautiful diffused lighting, but the current consumption was high for the visibility obtained. The use of ornamental street-lighting fittings but made more striking the multiplication of ugly obstructions.

Lynn is a city of about 100,000 inhabitants. At the entrance was a large board, bearing automatic coloured traffic signals and also in great letters the information: "Best Lighted City in the World." The street lighting is described in a booklet prepared by the General Electric Co. (of America), containing a map showing where the various types of fittings are to be seen. The city streets were lit with both luminous (or magnetite) arcs and filament lamps. The typical fitting for the former had an oval light alabaster rippled globe on top of a relatively short pillar. Urn-shaped globes of rippled glass were also used. Filament lamps were usually enclosed in asymetric dome refractors within light alabaster rippled glass globes, a common combination in America.

Some of the streets, like others in America, were of cement or concrete. Everywhere this seemed to give the best reflecting surface. The main street was well lit, but the spacing seemed too long in some of the side streets.

The cost of street lighting in Lynn was stated to be a penny per week per head for 1927; in other cities of similar class in America 6s. 3d. to 8s. 4d. per annum. We learned that a plan was in progress for further improvement of the street lighting in Lynn, and that then the cost per head would come nearer to the higher figures.

One main thoroughfare in Philadelphia was lit with lamps in rippled glass globes, two lanterns being suspended from short arms on an ornamental pole, painted a brown, which gave an appearance of bronze. Four poles were placed at the corners of certain street intersections. Generally, in those streets with double lamps and spacing about 150 ft., silhouetting was good at all points. In one such street we could see objects clearly to 200 yards. Similar visibility, however, is obtained in Sheffield and Glasgow streets with a smaller expenditure.

Some side streets were lit with gas. The lanterns were of a type which we found universal in America wherever gas was used for street lighting at all. The cylindrical glass contained an upright mantle, in a clear glass chimney, with a refractory cylinder above. There was a clockwork controller. The mounting height was about 9 ft.

Street lighting by gas was almost absent in the cities and small towns which we visited. We saw hardly any inverted mantles in use in the streets.

One of the most satisfying installations of floodlighting seen in America was that for the dome of the Capitol, of Washington. Only white light was used. The effect was dignified and, seen through the branches of neighbouring trees, picturesque. Throughout most of the city there was an absence of the thick overhead cables and other excrescences prominent elsewhere. The cabling for the street lighting was underground, and the standards and fittings were in entire harmony. Only in some of the new suburban side streets did we see bare lamps under radial-wave reflectors mounted on wooden poles. Magnetite arcs were largely used in Washington. The visibility was rather poor, the light, from a height of about 18 ft., not getting properly across the very wide streets, especially as the trees planted along the sidewalks tended to hide it. Lighting and extinguishing were accomplished by astronomical time switches either in the sub-station or in street manholes. Half the lamps were lit all night, half extinguished at 1 a.m.

Cleveland has been the scene of many experiments and improvements in street lighting, and may be taken as representative of the latest American practice. In retail business streets lamps varying from 10,000 to 25,000 lumens (say, from 500 watts upwards) are used with a mounting height varying from 15 to 18 ft., the standards placed opposite and spaced 90-100 ft. apart. In thoroughfares or arterial traffic streets 10,000- to 15,000-lumen lamps are used with a mounting height of 18-21 ft., and staggered spacing of 100-150 ft. The mounting heights are less than we use with lamps of similar wattages; but the "Novalux" glassware makes them feasible. Octagonal lanterns were frequently seen.

In Superior Avenue, one of the leading thoroughfares, the lighting was according to the best American practice, having 2,500 lumen lamps, opposite, with 100-ft. spacing, 18 ft. mounting height—a very high consumption per linear foot. Yet the vision at night beyond a short distance of motor cars and of persons, except of the latter dressed in white clothes, was by silhouette.

The most brilliant lighting seen in Cleveland was at the

crescent immediately in front of the new Union Terminal Tower building, which was to form a central railroad station for the city. It is worth while to consider the importance, for safety and also for visitors' first impressions of a city, of good street lighting about places of arrival: railway stations, harbours, and main arteries.

The elaborately ornamental standards here were exceptionally tall and stout with still wider ornamental bases. They were placed only 18 to 24 ft. apart along the kerb. Carried on each of two torch-like supports at about 27 ft. from the ground was a 25,000-lumen lamp in a large ornamental globe. The poles were of pressed metal, made specially thick to withstand the pull of the trolley-spans which were clamped round them. The cost of street lighting of the best classes in Cleveland was stated to be £2,000 per mile per annum. On the other hand, we noted the poor lighting of what we should call rather important secondary streets.

On September 13th we continued our train journey to Detroit. In Detroit, Washington Boulevard was the most distinctively lighted street, and has become famous as expending more energy per linear foot than any other street in the world. With 5 kilowatts per post it beats State Street, Chicago. The appearance of this boulevard, although expensively obtained at 92.6 watts per linear foot, was certainly imposing and an excellent advertisement. The local estate paid for the installation. Some main roads are stated to be lit for 30 to 40 miles out of Detroit.

In Chicago, State Street has the most famous street-lighting installation. The street is about 110 ft. wide. In spite of the great candle-power provided by 4,000 watts per post, placed opposite and usually spaced at 100 ft., vision was by silhouette beyond the second post. The cost of the installation, approximately £286 for each post, was paid by the State Street merchants, except that the city pays a share equivalent to the cost of the original city installation which was removed.

The very wide boulevard leading to the University of Chicago had concrete pillars, each carrying at a height of about 14 ft. a spherical globe. The appearance was very pleasing.

The street lighting in Chicago was under the Commissioner of Gas and Electricity, Mr. Michael J. Kennedy, who also had the management of fire-alarm, telegraph, and police telephone systems, the traffic control systems, and the inspection of all electric wiring, equipment, and work within the city.

The electricity for street lighting was obtained from the hydro-electric plant of the Sanitary District of Chicago. Under contract with the city, the Sanitary District installed and operated at first arc lamps, and, later, gasfilled filament lamps. According to the usual American system, when big improvements in street lighting are proposed, bond issues were voted by the people for extensions to the street lighting. In 1924 the rate for energy supplied by the Sanitary District was less than ½d. per kilowatt-hour.

Of all the cities which we visited, Toronto came nearest to our own idea of street lighting. The municipality took the lead in all improvements, and the lighting of all streets was considered. Much of the lighting was requiring improvement, especially in some of the very wide main streets. The Mayor, however, in his address of welcome, said that they knew that the street lighting required improvement, and later we found that the city was carrying out a continuous programme of improvement in the main thoroughfares. The annual cost of the lighting was stated to be $500,000. The main business streets had not the spectacular displays of some other cities, but they were well lighted. In the newer installations gas-filled bulbs were used in ornamental globes, at about 15 ft. height, placed opposite and spaced at 100 ft. and closer.

The remarkably uniform appearance of the street lighting was chiefly due to the close spacing in the residential streets. Lanthorn-like fittings of unique design were used, each containing a 100-watt bulb frequently opposite and spaced at 75-105 ft. The spacing is like that of Glasgow and Sheffield, but with the number of lamps doubled by the arrangement opposite.

The cable downtown was underground, but most was overhead. Most of the switching was done from the sub-station, from which special feeders went out for the street lighting. Lighting was by time-schedule and was all-night and all-year.

The street-lighting fittings in Montreal were of the usual ornamental American types; but generally the spacing was too great and the mounting height seemed in relation rather low. Visibility was insufficient where there were not reflections from buildings or road-surface.

The Secretariat Committee, in its report, put forward ten points as matter for discussion at Saranac. This arrangement was followed. Actually, the centre of discussion was our British Specification for Street Lighting.

Mr. C. C. Paterson, in his paper, provided a clear statement of the nature and aims of the specification, and it was heartily endorsed by the British Street-Lighting Sub-Committee as an effective interpretation. The main difference was that the British laid stress on the measurement of minimum illumination in a street, other countries on average illumination. Among the Americans, further, was a school which gave little heed to measurement of illumination at all and preferred to lay out and evaluate installations by the number of lumens provided per linear foot. The leader of the British Sub-Committee and his colleagues had to point out repeatedly that the specification did not use minimum illumination as a criterion of the effectiveness of an installation, but only as a method of classification. No single method of estimating the effectiveness of a street-lighting installation was satisfactory, but minimum measurement was the simplest and most practical. While other nations were not asked to change their preference for average values, they should also give the minimum in any statistics to allow international comparison of installations.

As it appeared difficult to get any definite resolutions passed, Mr. Sully moved that a sub-committee, consisting of representatives of Germany, France, America, and Great Britain, should be appointed to try to make a definite proposal. This was approved, and our leader was chosen as British representative. The sub-committee met and managed to agree on a series of resolutions, generally on the basis of the British proposals. These were submitted to the third session and were approved with minor amendments.

We can here recapitulate a few of our general impressions of lessons from America. The only satisfactory street lighting is by lamps of large candle-power, mounted suitably high and spaced reasonably close: that is, within the limits of the spacing-height radio of our specification. Bad lighting in America was mainly due to excessive spacing and insufficient height. Street lighting ought to be kept under the control of the local authority: at any rate, in Britain.

The lighting of the streets of a town should be graded according to their importance, but all should be lit well. We have not the super-lighting of some American main streets, but we do tend to pay more attention to side streets.

We must distinguish between American practice and principles. Some American streets are badly lit not because the principles are wrong, but because they are not applied. The "Principles of Street Lighting" of the I.E.S. gives an average horizontal illumination of 0.25 f.c. as the minimum for thoroughfares, attainable at an expenditure of 50-100 lumens per linear foot; for residence streets at least 0.05 f.c. average, obtainable from 10 lumens per linear foot. Differences, perhaps, from our own ideas, are in certain heights recommended and some of the spacings recommended for residential streets, which are longer than we should like.

Most of the installations had lamps larger than 100 watts. As regards theory, the "Principles" recommends that lamps of at least 1,000 lumens and preferably of 2,500 lumens and larger should be used, and that the lowest mounting-height of any should be 15 ft. We agree. Special consideration should be given to wide streets.

Glare did seem in many installations to be greatly reduced by suitable glassware; although there were others where we found distinct glare from globes of diffusing glass, mounted at, say, 15 ft. In any case, high mounting should be preferred and also illumination upon the street ought not to be allowed to suffer from absorption in the glass.

Street-lighting in America seemed considered more from the artistic than the scientific point of view. Considerable importance was attached to daylight appearance. In many streets efficiency suffered. Yet the use of definitely decorative fittings of simple outline could with advantage be extended in this country.

The provision of special cables for street lighting, both overhead and underground, extending over large areas, and of sub-stations devoted to public lighting, seemed to be much more developed in America than in Britain. One accompaniment was the more general use there of remote and centralised control. Automatic lighting and extinguishing were obtained also by time switches, relays, and other methods.

The cheapness of electric bulbs in America as compared with the prices in this country made it possible to use larger sizes. Comparative prices were: 60 watt, 22 to 30 cents, or 11d. to 1s. 3d., as against 2s. 3d. in Britain; 100 watt, 35 to 48 cents, or 1s. 5½d. to 2s., as against 4s. 3d. in Britain; prices of other lamps being in proportion. Among reasons given for this difference were the much larger number of voltages used in Europe and therefore of ratings of lamp demanded, and the larger number of types of lamp demanded. Manufacturers in America had concentrated on a small number of types. Parallel with this standardisation and the vast development in demand, there had been numerous price reductions. It was stated that since 1914 there had been a general increase of 60 per cent. in the cost of living, but a decrease in the cost of light of 50 per cent.

The "booming" of street lighting in America was mainly due to the manufacturing firms and the local electricity supply companies. It was notable also how largely the laboratories for research on lighting were provided in America by manufaturers. The outstanding exception was the Bureau of Standards. Very little progress was primarily due to the municipalities. Even in this country too little addition to research and practical experiment is contributed by them. Few street-lighting departments are even moderately well equipped for such work, even for necessary routine testing.

A notable development in America which deserves more consideration in this country is the lighting of rural highways carrying heavy traffic between towns. The lighting has been made easier by the bringing of electricity through a district by overhead cables on posts alongside. The lighting fittings are attached to these posts.

Discussion on Messrs. Colquhoun's and Stewart's Paper.

Councillor THRAVES, of Sheffield, asked whether, in America, greater consideration was given to the spectacular side than to the lighting side.

Mr. COLQUHOUN replied that in America the practice was to concentrate, more or less, on the main streets, where the lighting was well done, but the cost of that lighting was, in many cases, borne by the merchants on those thoroughfares. On the other hand, the lighting in the residential areas, and in some of the fairly busy streets, seemed really deplorable, and would not be tolerated in this country, where people expected a good deal of service from the municipalities. In America the people did not expect a great deal from the municipalities. He added that in some of the well-lighted areas the pleasing appearance of the fittings was spoiled by their proximity to ugly wooden poles and tramway standards.

Mr. JAMES MACDOUGALL said it would be interesting to know how the mechanical traffic controls worked in America, seeing that they were in the experimental stage in this country.

Mr. COLQUHOUN answered that he thought there were more traffic control signals in New York than in all the rest of the world. The lay-out of American cities, where the streets ran at right angles, allowed of the mechanical system being used. His impression was that the tremendous volume of traffic in New York would be impossible without that method of control. Replying to Mr. J. Clark, of Aberdeen, he said there was no uniformity of method in placing the controls, but the newer ones were being put at the corners of the streets. American requirements, however, were not identical with those in this country.

Mr. C. W. SULLY suggested that a meeting such as theirs could give a great deal of assistance to an international committee dealing with lighting questions, and Mr. Colquhoun said the Association would consider the matter.

On the glare problem, Mr. J. H. CLEGG, of Burnley, said it was obviously a serious question also in America, and they seemed to be dealing with it there by opaque glassware. Had the delegates to America considered the coloration of lighting? It had an important bearing on street lighting. A restful light was as desirable in street lighting as for interior decoration. He added that he had been struck by the great amount of lighting by electricity in America. Was it due to cost?

Mr. COLQUHOUN said he could not give the reason for the extensive use of electricity and of so little gas for public lighting, but he thought it was a question of financial arrangement between the companies. He had no evidence, however. Some of the main boulevards and arterial roads running through the country were lighted by the State, and not by the town or city.

Mr. L. SUTCLIFFE, of Woolwich, asked if the same thing could not be done in this country on rural highways, and Mr. E. C. LENNOX, of Newcastle, asked if the Ministry of Transport could not be approached with reference to the matter. If street lighting ought to be kept in the hands of the local authorities, then there must be a change from rural control, and it should be left to the County Councils.

The PRESIDENT said that those who had had experience of annexation schemes knew that rural authorities did not like outside interference.

Mr. LENNOX retorted that the majority of parish councils and rural councils would be only too pleased to let the bigger authorities take over their lighting.

Mr. A. C. CRAMB, of Croydon, asked why in America elaborate public lighting fittings were put up amid hideous structures, such as signs and advertisements. He believed in the use of the inexpensive post for street lamps. Ornamental fittings might be justified for parks and promenades, and for seaside resorts.

Mr. L. DOW suggested that every year members of the Association in all parts of the country should furnish particulars of what advances in lighting were being made in their areas.

The PRESIDENT stated that steps would be taken to incorporate such information in their annual report.

(To be concluded.)

Municipal Tramways and Transport Association—I.

A Report of the Twenty-eighth Annual Conference at Great Yarmouth.

ALTHOUGH at one time it was thought possible that the 1929 conference of the Municipal Tramways and Transport Association would be held in the town of the President, *viz.*, Belfast, it was utimately decided to accept a very cordial invitation from the Great Yarmouth Corporation.

Mr. William Chamberlain, the President, presided throughout the three days of the Conference (September 11th, 12th, and 13th), the first two of which were devoted to serious business, whilst the final day was devoted to a trip round the Norfolk Broads, for which the weather was perfect, enabling these unique waterways to be seen at their best. The annual dinner was held on the evening of Wednesday, September 11th, when the Minister of Transport was the principal guest, whilst the Yarmouth Corporation entertained those attending the conference at luncheon on Thursday, September 12th. As usual, there was a fine collection of up-to-date motor-omnibuses parading the streets, and they created considerable interest among the members of the general public along the extensive Yarmouth front.

On Wednesday, September 11th, the Association—which met throughout the conference in the pavilion on Wellington Pier—was given a welcome by Councillor H. T. Greenacre (Mayor of Yarmouth). The Mayor spoke of the fact that tramways easily had the lowest percentage of both fatal and non-fatal accidents incurred by any form of transport. The tramway undertakings of the country carried last year 4,140 million passengers—3½ times the number carried by all the railway companies put together. He said he was in a rather awkward position, because he had opposed the re-construction of the tramways in Yarmouth, but he was comforted to some extent by the fact that the Association now called itself the Municipal Tramways and Transport Association. Whilst no vehicle could move such vast masses of people from the suburbs to the centres of large cities as tramcars, they were a great hindrance—in narrow and congested thoroughfares—to the rapid movement of every other vehicle, and there was no doubt that in future they would have to rely on 'buses as well as tramcars. He thought that some independent controlling authority was needed with large powers over wide areas to decide the kind of vehicles that should be allowed, according to the character and congestion of the district.

In his presidential address, Mr. WM. CHAMBERLAIN referred to the Royal Commission on Transport, and deplored the reluctance of municipal authorities to conform to schemes of co-ordination. He epitomised the views of the Association on the subject as follows:—

"This Association is in favour of an efficient and effective system of controlled co-ordination of the services for road passenger transport, operated by those who are financially substantial and can meet their obligations, ensure regularity of service, and recognise proper conditions of service and rates of wages. It is not prepared to enter into co-operation with operators who do not pay fair rates of wages and observe fair conditions of service.

"The aim of such co-ordination must be pre-eminently to serve the public. It has many advantages for that purpose, both from the operators' and the passengers' point of view, and, so far as I know, there are no disadvantages. It will enable the maximum use to be made of all the means provided for road passengers, whether within or outside the area of the local authority.

"It will eliminate waste by utilising all the available seats, especially during traffic 'slack hours.' It will avoid conflict between various interests operating services beyond the statutory traffic areas of local authorities. It will tend to reduce traffic congestion to a minimum, and promote greater efficiency, safety and reliability, and, because of the narrow margin of profit per passenger, which wasteful competition affects adversely, and in some cases destroys, it will enable a great and important public service to be conducted on a sound commercial basis.

"But it must be amply controlled if these advantages are to flow from it.

"It must be secured from erratic competition, which aims, not at providing regular public services, but profit first and foremost."

He thought that the conditions of public service transport in Belfast in 1928, described as "chaotic" and "impossible" by the Commissioners, appointed by the Government of Northern Ireland to inquire into the application by the Belfast Corporation for confirmation of the proposed by-laws with respect to public service vehicles, would be of interest, and significant to Great Britain in general and to the Association in particular.

During 1928 extraordinary conditions were created and developed in the streets of Belfast by the introduction of a large number of privately-owned vehicles to compete at random with the tramways for city traffic. The necessity for by-laws sprang from the state of affairs so produced. The receipts from the tramways dropped by as much as £4,000 per week.

At the inquiry, which occupied eleven days, the Corporation claimed, in effect, the monopoly of city traffic, together with its provision and control. That claim was strenuously opposed by

the private owners of omnibuses. In a complete and exhaustive report issued by the Commissioners they deeclared:—

"We have come to the conclusion that on general principles it is more advantageous to the public that the whole traffic undertaking of a city should be in one hands, subject to certain safeguards, and that under such a system the public can receive quite as an efficient service at a cheaper rate than if there is competition."

The proposed by-laws as affecting Belfast were not confirmed, but the Government took much more comprehensive steps, and dealt with the situation as it affected the whole six counties of Ulster, and issued The Public Service Vehicles (Amendment) (No. 2) Regulations, 1928. As a result the Corporation became the operating authority responsible for the provision of means of road passenger transport for persons travelling wholly within the city, and, where the tramways extend beyond the city boundary, for the area served by them and a quarter of a mile beyond in each case, if and so long as an adequate and satisfactory service was provided.

On the other hand, private owners of public service vehicles throughout the Province were given protection from unnecessary and unfair competition. All public service vehicles were to be controlled by the central authority. The result had been entirely satisfactory, and he was in favour of a controlled monopoly in the hands of local authority of rail passenger transport services.

Alderman W. R. WILLIAMS (Cardiff), proposing a vote of thanks to the President, said that municipal transport undertakings were handicapped by the unfair restrictions placed upon them by legislation.

The annual general business meeting of the Association was then held, and, in moving the adoption of the report of the executive committee, Bailie C. C. HUTCHISON expressed satisfaction that the Association intended to promote another Bill next session, giving wider powers to municipalities in connection with motor-omnibuses. The Association's Bill was defeated by a small majority in the last Parliament.

A discussion then took place on the subject of electrolysis, and references were made—in a private discussion—to negotiations that are taking place between the Post Office, the Ministry of Transport, and the Association.

The Association unanimously elected as honorary member Mr. John Aldworth, late general manager of the Nottingham Corporation tramways, and one of the founders of the Association.

The accounts of the Association, which show a credit balance of £584, were unanimously adopted.

Alderman Canby (Huddersfield) was elected president, and Mr. R. S. Pilcher (general manager, Manchester) was elected vice-president.

The following were elected to the executive council: Alderman Clark (Rochdale); Councillor Gledhill (Halifax); Mr. W. Forbes (general manager, Cardiff); Mr. L. Mackinnon (general manager, Glasgow); and Mr. J. M. Calder (general manager, Reading).

A Large Battery Works.

A Report of a Tour of Inspection of the Factory of the Chloride Electrical Storage Co., Ltd.

A LARGE party of gentlemen interested in the manufacture and use of electric accumulators visited the works of the Chloride Electrical Storage Co., Ltd., at Clifton Junction on September 10th, following luncheon at the Midland Hotel, Manchester. It is four years since a similar visit was made to the works; since 1925 the land occupied by the works has been increased by 40 per cent., and the covered section has been made larger by 100,000 square feet. In inspecting the works a good idea was obtained of the whole process from the manufacture of the individual parts to the charging and packing of the finished battery. One could not help being impressed by the number of different types of batteries made to suit all purposes, from pocket flashlamps to submarine and power-station batteries. In the last few years, wireless, in addition to the expansion of the motor industry, has increased the demand for accumulators, and the latest development, which is distinctly promising, is the manufacture of batteries for the "Talkie Films."

Fig. 1.—Assembling "Exide" Car and Portable Batteries.

In the moulding shop various interesting operations included the pressure casting of box negatives. The moulds are arranged around a circular cast-iron pot containing molten antimonial lead and heated by gas burners. A thin sheet of finely perforated lead is placed in the mould, and the two halves of the latter are brought together by hydraulic pressure; the molten metal is then forced into the closed mould by compressed air, and the grid so formed is automatically and ingeniously attached to the sheet of the perforated metal previously inserted to form one half of the box negative grid.

So large a concern requires a very large engineering shop: it is divided into two sections, one devoted to maintenance and repair, and the other to the manufacture of the special moulds and tools used throughout the works. The first includes a motor repair pit, electricians' benches, acetylene burning equipment, and a blacksmith's shop. In the second section are electrically-driven planing machines, special rack-cutting machines, surface grinders, turning lathes, and milling machines working to 1,000th of an inch, special apparatus for the machining and assembly of different parts of the moulds used in casting plate grids, and the making of assembly jigs for various parts of batteries.

With lead playing so large a part in the construction of batteries, the company has had to devote a great deal of attention to the hygienic side, and the prevention of injury to the health of its workers. For example, in the department where the "Exide-Ironclad" tubes are filled with red lead, which forms the active material, elaborate precautions are taken to prevent lead dust from mingling with the air. The floor is continually watered, the men wear respirators, and are further protected by a special design of shaking booths and exhaust ventilation. At the end of the shift the men strip off their working clothes, which are provided by the company, and have a compulsory bath before putting on their own clothes. Ample time for the men to have their baths is allowed. Special washing and dressing rooms are provided for all men handling lead and lead oxides. They are equipped on an elaborate scale with hot and cold shower baths, and many special appliances. They are fitted with special jets for mouth

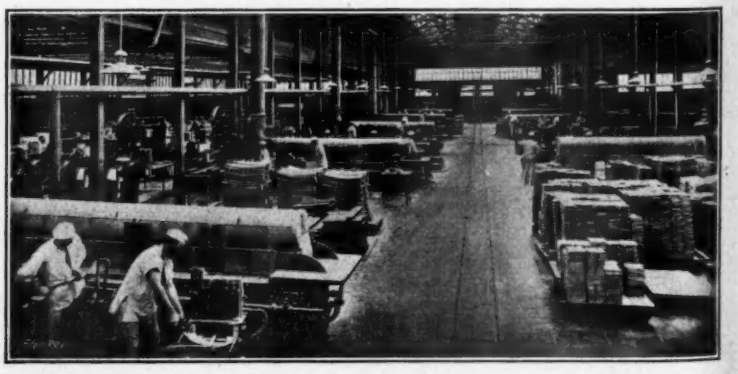


Fig. 2.—One of the Plate-moulding Departments.

washing, and each man is supplied with a tooth brush, dentifrice, and a clean towel for every shift; special soap and hand creams are supplied, and every man has separate accommodation for his outdoor clothes. These safeguards are under the supervision of a resident doctor, appointed by the company at the end of 1927, who devotes the whole of his time to the study of lead poisoning. Blood examinations are conducted periodically, and by this means any increase in the amount of lead absorption in the blood is detected immediately, long before there is any sign of trouble in the worker. Thus any defective process on which a man is employed is immediately discovered, and measures taken to stop the trouble before lead poisoning has had time to develop. Since the end of 1927, these precautions have proved so successful that there have been no cases of lead poisoning at the works. The company is in fact very much more strict than the official regulations require, and has been able to give considerable assistance to the authorities in forming regulations for lead workers. The works has a dental clinic under the direction of a qualified dental surgeon and nurse.

In the charging room, objects of special interest were large submarine cells receiving their charge. One submarine requires 330 cells, and the installation weighs about 250 tons. It is of interest to note that during the war the average output was equal to 100 tons of "Exide" submarine batteries per week. The charging room also included starter batteries, ships' wireless batteries, and house-lighting batteries being charged.

The company claims to be now the largest maker of batteries in the British Empire and one of the "big three" in the world. The works gives direct employment to 2,000 people, and occupies an area of 37 acres. In addition to branch works, there are a large number of "Exide" service stations in all parts of the world; there are over 600 of them in the British Isles and more than 8,000 throughout the world.

Amongst other important parts of the works is the electricity power house, where current enters the works at 10,000 volts and is transformed to 400 volts, which is stepped down by a.c. motors driving d.c. machines to supply the works at 100 volts. Then there is the test house where research work and capacity and continuous life tests are made on batteries. There is also the model "Exide" service station. Most of the "Exide" service agents receive a course of instruction in battery repair and maintenance work there; those who do not are trained at one of the many "Exide" depôts throughout the world. There are assembled wireless h.t. and motor-car starter batteries. Domestic lighting batteries are sent out from there fully charged and ready for service.

Engineering and Shipbuilding Exhibition.

A Review of some of the Exhibits of Electrical Interest.

(*Continued from page 456.*)

IN our last issue we referred to the opening of the Shipping, Engineering, and Machinery Exhibition, and gave particulars of some of the exhibits. At the inaugural luncheon, over which the Duke of Northumberland presided, Mr. A. V. Alexander, M.P., First Lord of the Admiralty, who was the chief guest, said he felt concerned during his trip throughout the Empire because British industry had not quite the Government publicity that it should have. Trade commissioners had now been appointed in Australia and at Singapore. Attention would have to be given to similar propaganda in foreign countries. The Government was awaiting with interest the full report of the trade mission to South America, and he hoped that it would be possible to consider further developments of that kind. Among the many distinguished men present at the function may be mentioned Sir Alexander Kennedy, Sir Robert Hadfield, Dr. H. S. Hele-Shaw, Sir Philip Dawson, and Messrs. D. A. Bremner and W. H. Patchell.

We continue below further particulars of selected exhibits.

Domestic Appliances.

Fig. 7 shows a new model of "Oatway" electric hot-water radiator, which is being displayed by OATWAY SAFETY HEATING CO., LTD. It is of the honeycomb type fitted with an immersion heater, and is made in brass with copper or nickel-silver finish. It is suitable for screwing to the walls in cabins and saloons. The heating surface is 72 sq. ft. The dimensions

Fig. 7.—"Oatway" Electric Hot-water Radiator.

are: height 18½ in., width 25 in., and depth 4½ in., and it weighs 36½ lb. The loading is 2 kW.

INVENTUM ELECTRICAL APPLIANCES, LTD., are exhibiting a range of "Inventum" electrical fires, water heaters, and cabin heaters. The standard electric fires are all of the radiant type, and comprise a number of trough-shaped reflectors of true parabolic section, the heating element being correctly focused in the reflector to give the maximum radiant heat in all directions. The heating coil of the element is supported throughout its entire length on specially shaped grooved porcelains which, whilst providing adequate support for the wire and eliminating all possibility of "sag," are so small that the mass to be heated is negligible. The element "plugs in," and it is a very simple matter to keep the reflector clean, bright, and efficient. The introduction of chromium-plated reflectors has added to the efficiency and general appearance of the fires. The new "Inventum" ceiling heater, designed for use in conjunction with an electric light fitting, is publicly exhibited here for the first time. For dining rooms, offices, cabins, &c., where heat is required over a restricted area, its advantages will be readily appreciated. Inventum water heaters are of the low-loaded thermostatically controlled type, and typical examples are shown in use.

Welding Plant.

The PREMIER ELECTRIC WELDING CO., LTD., a subsidiary of Imperial Chemical Industries, Ltd., is exhibiting a large number of mechanical and semi-mechanical devices for producing rapid and sound welding by means of coated electrodes. Included in these exhibits is the "Flexin" hand-welding tool and the "Flexin" flexible electrode. The "Flexin" system consists essentially of a flexible steel electrode wound on a drum, and an air-driven hand tool for feeding this electrode to the work. The tool takes the form of twin grooved rollers driven by an air motor, and is so designed that the starting and stopping as well as the speed of the feed are controlled by the operator. The flexible electrode is a stranded electrode made from a multiplicity of fine wires arranged in such a manner that there is intermittent electrical contact between each wire throughout the length of the electrode. By this means an even distribution of current throughout the flexible electrode is ensured. The interstices between the wires are filled with flux, and the outer surface of the electrode is burnished, so that when passing through the welding tool it picks up current readily from the nozzle without undue sparking or heating. It is claimed for this tool that by passing heavy currents through the electrode very high welding speeds and strong welds are obtainable. On account of the fact that the electrode is always moving and that only a small portion projects beyond the nozzle during welding, very heavy current densities can be carried without making the electrode red hot. It is quite easy, for instance, to weld with a current of 200 amps., using an electrode equivalent to a No. 10 gauge wire and with 300 amps., using an electrode equivalent to No. 8 gauge wire. The electrode is supplied wound on returnable steel drums in 500 ft. lengths, and its price is similar to that of the ordinary 18-in. rigid electrode. The tool is inexpensive, and as the moving parts are very few, wear and tear is reduced to a minimum. It is fitted with ball bearings throughout and lubricated by means of a grease gun.

Messrs. BULL MOTORS, LTD., are giving prominence on their stand to electric arc-welding plant. An exhibit of particular interest is the new "Midget" type 100-A portable arc-welding set, fig. 8. The control gear and instruments are assembled in a sheet steel cubicle, and the control of the welding current is carried out on both shunt and series fields. The set is provided with the new "Bull" welding reactance, and the design is such as to ensure great flexibility of operation and satisfactory welding down to a current of 25 A. This renders the set particularly suitable for use with thin sheet steel, and

in this sphere it can be safely said that it has a promising future. A standard 200-A portable arc-welding plant is also shown, and arrangements are made so that both sets can be viewed under actual welding conditions. Some interesting examples of welding work carried out by leading engineering firms with Bull arc-welding sets are exhibited. In addition to welding plant, there is a number of machines of types particularly suitable for marine work. An interesting exhibit is a weatherproof motor which is direct coupled to a pump, the pump being so arranged that the motor is continuously subjected to a downpour of water of tropical intensity. This type of machine, although ventilated, is entirely suitable for installation in an exposed situation. Examples of "Bull" explosion proof direct and alternating current motors are exhibited. These machines are suitable for installation under such conditions as obtain in fiery mines and oil pumping installations, and Messrs. Bull Motors hold the certificate of the Mining Department, Sheffield University, which covers their construction.

The exhibit of the A. C. WELDING CO. consists of various types of portable "Alternarc" alternating-current arc-cutting and welding machines of improved design suitable for use with any welding electrode on the market, whether bare or coated. The machines are of unique design and embody the necessary transformers, choke or impedance, and regulator as one unit of special design, housed in a distinctive ruggedly constructed case. The design of transformer, in each instance, is such that extremely high arc stability is present in the arc to meet the varying conditions of load. Means of adjusting the open-circuit voltage, arc current, shape of characteristic curve, penetrative effect, and permissible arc length are provided to suit the varying conditions of type and size of electrode, class of work being welded, &c. The range of machines on view includes the improved light weight "Type G.S. Alternarc" plant suitable for garages and small engineering shops, marketed at a price approximately one-fifth of the price of a standard motor-generator set. The "Alternarc" automatic exposed voltage limiting device, of improved design, will also be demonstrated. This device, at all times, whether the arc is "dead" or operating, limits the exposed voltage at the electrode holder to a value of 35 volts, and, therefore, when fitted to any a.c. arc-welding apparatus, it enables alternating current to be used for arc-welding purposes with perfect safety under the most hazardous conditions of risk. A comprehensive range of "Alternarc" operators' equipment is also on view. "Newarc" electrodes of various sizes, types and grades of welding and cutting will be available on the stand, and demonstrations will be given showing the economy which can be effected by their use.

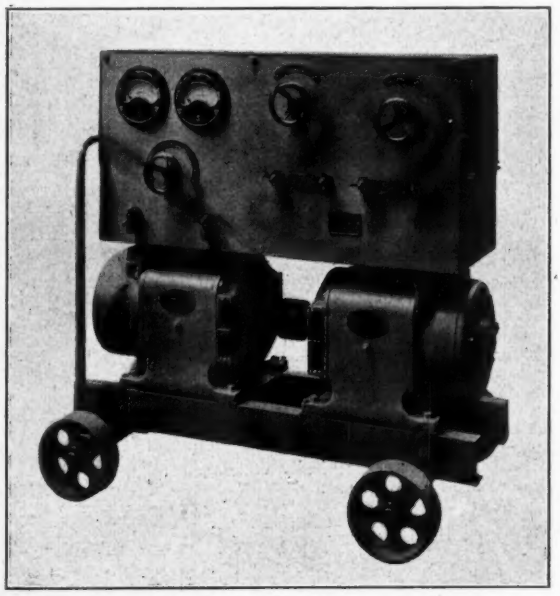


Fig. 8.—"Midget" Portable Arc-welding Set.

ALLOY WELDING PROCESSES, LTD., have on view ten different types of welding equipment, including their latest design of motor-generator set, which is of lightweight and small dimensions. Demonstrations are given daily in the use of the makers' special electrodes. It is interesting to note that the chief manufactors of corrosion and heat-resisting steels, such as Messrs. Edgar Allen & Co., Ltd., Brown Bayley's Steel Works, Ltd., Thos. Firth, Ltd., Hadfields, Ltd., and Vickers Armstrong, Ltd., are interested in these special electrodes, and have carried out tests in their Sheffield laboratories, which, it is understood, were satisfactory.

Radio-telegraph and Telephone Apparatus.

The following items may be seen on the stand of SIEMENS BROS. & CO., LTD.:—Electric ships' telegraphs; telephones for navigational purposes; an electric helm indicator; an ahead and astern revolution indicator; a navigation lights indicator; a "look-out" indicator; and torsionmeters.

The exhibits include two of the company's i.c.w. transmitting units, sizes 200/300 and 400/500, which have been designed to take the place of the ½- and 1½-kW spark transmitters, respectively, the use of which has been restricted by the Washington Convention of 1927. An auxiliary short-wave transmitter employs a 500-watt oscillating valve, and is suitable for use on vessels which wish to maintain communication during a period each day from any part of the world with the mother country.

A short-range telephone transmitter suitable for use on board coastal vessels, survey vessels, &c., is also shown. This installation is tuned for the marine telephone wavelength of 220 metres, but it possesses the great advantage that it may be tuned to 600 metres and used for i.c.w. Hence a vessel equipped with this type of transmitter can take part in a distress call, and, within the limits of the range of its apparatus, has the same facilities as are possessed by vessels equipped with more powerful installations. Another feature is the quenched-spark wireless installation of ¼-kW size in its modern cabinet form. The use of this size of installation is not restricted by the Washington Convention, and it has been redesigned by the makers to fulfil the latest demands of the service. This station is completely enclosed in a teak cabinet, and complies with all the requirements of the International Radio-Telegraph Convention. It is particularly suitable for use on board small vessels, and where a continuous service is not available from the ship's dynamo, it can be worked off batteries, off the ship's mains, or off "floating" batteries. The receiver belonging to this installation is so tuned that it can be used not only on normal commercial wavelengths, but can be employed for receiving the signals sent out on short waves (below 100 metres) by many of the big transmitting stations of the world.

The RADIO COMMUNICATION CO., LTD., is exhibiting its latest types of marine radio apparatus for all classes of ships. A ship's cabin containing a complete 1½-kW radio transmitter and receiver conveys an accurate impression of the appearance and space required for efficient operation. The valve transmitter is of the most recent design for continuous and interrupted continuous waves, and conforms to all national and international regulations governing marine wireless installations. An independent emergency transmitter is embodied in the main transmitter. The two valve receiver covers a wave range of from 220 to 22,000 metres, and is capable of receiving from all types of transmitters on c.w., i.c.w., spark, and telephony. An interrupted continuous wave valve transmitter, with a power of ½ kW, specially designed for cargo and small passenger ships, and a wireless installation for lifeboats are also included in the transmitting installations exhibited. The direction finder takes the premier position among the radio aids to navigation, and the company is exhibiting its new radio direction finder for large and small ships.

The MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD., is exhibiting a comprehensive range of wireless and non-wireless apparatus. Replicas of wireless cabins on large and small ships are erected on the stand, and other apparatus is so arranged that the space necessary for the installation on board ship may readily be estimated. In the larger cabin a 2-kW valve transmitter (type M.C.6.) for continuous and interrupted-continuous wave telegraphy, and a short-wave transmitter (type 295) are shown, together with a quenched-spark emergency transmitter, and long- and short-wave receivers. The latest model Marconi direction finder (type 11 G) in which screened-grid high-frequency amplifier valves are used is also installed as on board ship. The smaller cabin illustrates the ¼-kW quenched spark transmitter, two-valve receiver, and Marconi direction indicator, installed in accommodation such as is usually found in small ships. The direction indicator is a modified form of direction-finding receiver comprising a small untuned single rotating frame used in conjunction with an amplifier of the type supplied with the 11 G direction finder. The instrument is designed to work over two bands of wavelengths, 180 to 300 and 450 to 1,100 metres. A number of other transmitters is exhibited on the stand, including new types of interrupted-continuous-wave valve transmitters of ¼-kW and 1½-kW rating. A self-contained wireless telephone set intended for use on board yachts, whalers, trawlers, and other small vessels, where a skilled operator is not available, is also shown.

The RELAY AUTOMATIC TELEPHONE CO., LTD., has displayed a No. 1 model automatic telephone exchange, which can be started with as few as ten telephones and can be extended indefinitely for any number of lines without limit. There are also models Nos. 7 and 10. No. 7 model caters for six to forty-five telephones, and, as in the case of model No. 1, can be built up from time to time without disturbing the service, but it is limited to forty-five lines. Model No. 10 is designed expressly to meet those cases where not more than ten telephones are likely to be required. This model can start with as few as five telephones, and be increased, as desired, until its full capacity of ten telephones is reached.

Fig. 9 shows the interior of a "Relay" No. 10 automatic telephone switchboard. It is suitable for wall fixing, and measures only 15 in. wide and 20½ in. long by about 7 in. deep. Another exhibit on this stand is an automatic staff call device which solves the problem of the urgent summons, and notifies the wanted person immediately, at any time, no matter in what part of the premises he may be. It is automatic and electrically operated, the installation

comprising merely the automatic central station and the calling device. "Relay" automatic staff call installations can be supplied to include a fire-alarm service to work from either the usual glass-fronted alarm push or the automatic telephone installation, or can, at any time, be extended to do so. The "Relay" train description equipment is now exhibited for the first time. This is an installation for use in railway

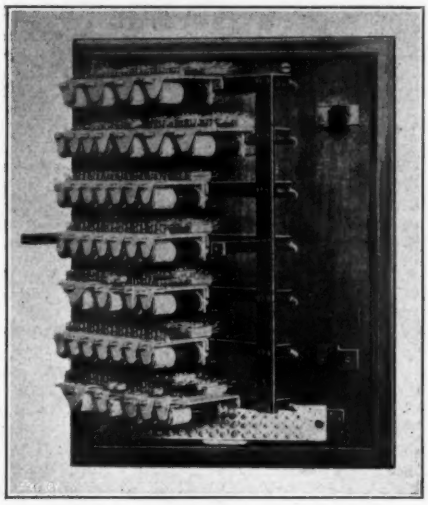


Fig. 9.—Interior of "Relay" Automatic Telephone Switchboard.

signal cabins to enable a signalman in one cabin to advise the next cabin of the identity of the trains successively approaching. The system is also applicable for platform indication.

Heavy Engineering.

The chief feature on the stand of Messrs. REAVELL & Co., LTD., is a range of deck auxiliaries driven by compressed-air for tugs, coastal vessels, yachts, &c., comprising winch, windlass, capstan, and steering gear. In the centre of the stand the office is made in the form of a chart house and bridge, the steering gear being mounted thereon. All these deck auxiliaries are fitted with air motors of the rotary type. They

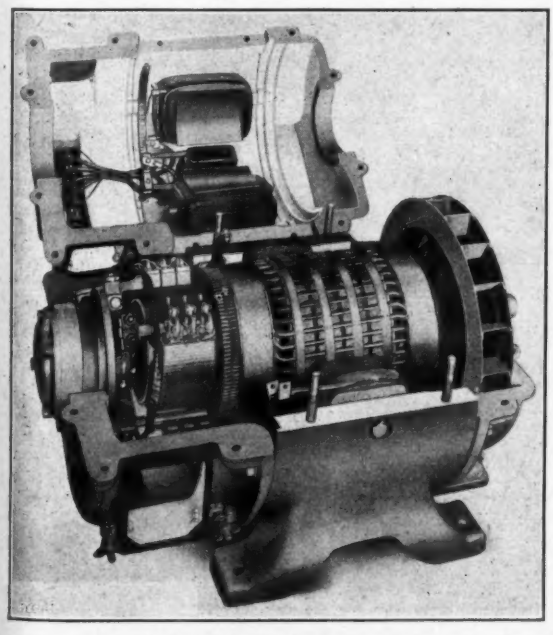


Fig. 10.—Marine-type "Metrovick" Motor.

are supplied with compressed-air from a vertical two-cylinder compressor driven by an Allen motor, controlled by Brookhirst automatic switchgear. Another important exhibit is a vertical, three-stage marine-type compressor with a capacity of 300 cu. ft. of free air per min. at a pressure of 1,000 lb. per sq. in. This is of the makers' M.A. type, which has now been entirely re-designed, giving much better accessibility.

Among some interesting items shown by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., is a 7½-kW ship's lighting set; a 5-h.p. T.E. vertical pump motor, which is capable of working at a varying voltage, such as would occur when supplied from a battery, at the same time giving the full-speed range within specified voltage limits; a 10-h.p. vertical pump motor of the marine type, designed for high-speed centrifugal pump drives and for silent operation; and a 50-h.p. ventilated marine-type motor, fig. 10, with the two halves of the machine opened out to show the main features of construction.

Messrs. LAURENCE, SCOTT & ELECTROMOTORS, LTD., are showing examples of electrical machinery for use on board ship, including worm-geared electric winches of several sizes, the latest designs of self-contained contactor-controlled winches, the new motor-generator type winch, giving very delicate control for special cargo handling, and an electric worm-geared boat winch. There are also various examples of the makers' new marine-type motor (deluge pattern), specially designed for driving ships' auxiliaries. These motors, fig. 11, both vertical and horizontal, are, in material, design, and construction, very different from standard "land" motors. The insulation is of special design to suit the onerous conditions of marine service, and the internal ventilating arrangements are designed to prevent the minimum of dust and oil from being deposited on the windings of the machines. The frame is split horizontally in such a way that the motors can be opened up for inspection, cleaning, and re-varnishing with the minimum of delay, trouble, and expense. A standard ship's generator is also on show, embodying the most up-to-date features. The "Donkin-Scott" all-electric steering gear is another feature of the exhibit.

On the stand of Messrs. EDWARD BENNIS & Co., LTD., are being shown working models of a natural-draught coking stoker on a single-flue Davey-Paxman economic boiler, a new type air-draught stoker applied to a two-flued marine boiler, a forced-draught chain-grate of the new carrier-bar

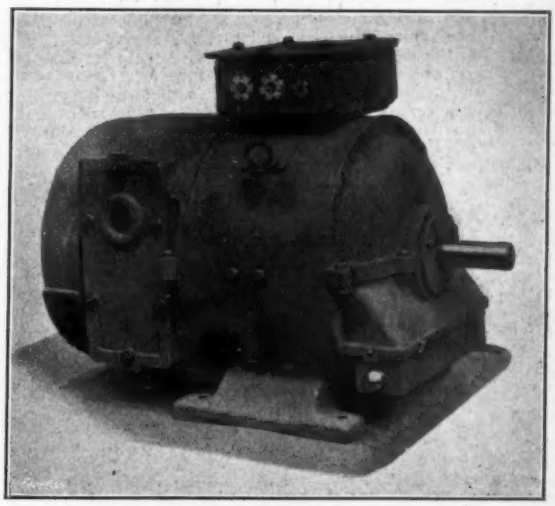


Fig. 11.—Deluge Pattern Marine Motor.

type with multiple air control, and a coal pulverising plant on the "Simplex" unit system. The "Bennis" coking stoker has, it is claimed, effectively solved the problem of providing a grate which is self-cleaning, quick-firing, rigid in construction and, at the same time, simple in operation and easy of adjustment, whilst remaining absolutely smokeless and gritless. The chief features of the new development of the Bennis "Sprinkler" stoker for marine work are: a modification in the method of supplying air to the furnace applicable for use with pre-heated air as well as air at normal temperature, and the introduction of cold currents of air internally through the grate bars to prevent over-heating of the metal.

FILM COOLING TOWERS (1925), LTD., are displaying a model of a cooling tower built to the scale of 1 in. to 1 ft., so arranged that the interior can be closely examined. There is also displayed a full-size section of the irrigation under working conditions, *i.e.*, with water running over, so demonstrating the film of water adhering to the laths. Various drawings showing details of the firm's cooling towers, as well as the performance curves drawn to a large scale, are also on show.

The TURBINE FURNACE CO., LTD., is showing the smoke bridge which is supplied as a standard fitting with the turbine furnace. The "Turnat" natural-draught furnace is attracting interest. It is an endeavour to apply the design of the turbine furnace firebar to an ordinary firebar, and so take full advantage of chimney draught or induced draught by equalising the distribution of the air pulled through the bed of fuel.

Messrs. BABCOCK & WILCOX, LTD., are showing a number of full-size sectional details of their water-tube boilers and furnace equipment as supplied for both marine and land purposes. Full-size examples of an actual oil-firing furnace sec-

tion, fitted complete with a pressure-type oil burner of the company's manufacture, is another feature. There is also an example of a "Babcock" oil-fuel pump and heating unit as used in conjunction with oil-firing installations. This unit is of the "Duplex" type, in which the pumps, heaters, and filters are duplicated and so arranged that one can be used while the duplicate fitting is being cleaned or overhauled. The pumps are of the vertical "Simplex" double-acting type, and are fitted with bottom liners. The heaters are of mild-steel throughout, with the exception of the oil end covers, which are of cast-iron. A feature of this equipment is that filters are fitted between the pump discharge and the heaters, as well as on the discharge side of the heaters. Some interesting examples of the "Babcock" patent interlock open steel flooring are also shown.

The exhibits of Messrs. E. Green & Son, Ltd., include models of a standard vertical-tube economiser with automatic scrapers, a patent tri-tube economiser, an H.V. economiser of the single-tube type, and a "Foster" economiser of the type installed in the largest industrial high-pressure steam-raising plant in Europe.

(To be continued.)

Correspondence.

Correspondents should forward their communications* as early as possible.** ***No letter can be published unless we have the writer's name and address in our possession.

Electricity in the Home.

Your leader in to-day's issue "On Being an Exception" is of considerable importance. It should be regarded as a sin for members of the electrical profession, especially those engaged in the selling side, not to use electricity for domestic purposes other than lighting when a supply is available. It can be accepted in the majority of cases that the comparison of costs, gas *versus* electricity, in most towns is such that a man of small means can use either commodity; there are, of course, exceptions to every rule. What would be the thoughts of a prospective purchaser of a motor car if the salesman called upon him in a donkey cart? "Costs" are not merely the amount of money paid for either gas or electricity; there are such items as "savings," and when the balance is drawn it may be found, as it often is, that fuel costs have very little bearing on the whole. It has been my pleasure on various occasions to prove that even if gas were free, it would be dear to use it for cooking, as against electricity at 2d. per kWh.

The question of installation cost is one of consideration to a man already living in a house not wired; but, again, is not an electrical engineer in a better position than others outside the industry? He can secure the necessary materials under most favourable terms, and, if need be, do his own fixing. If one is going into a new house the electrical equipment can be so arranged that the weekly cost of such would be represented by comparison with a packet of cigarettes. These are terms upon which I am daily arranging complete electric homes for people like 'bus drivers, clerks, shop assistants, &c., so why is the electrical engineer hesitating?

As I have lived in an electric home for over 20 years, it may be of interest to give the comparison of cost of two similar houses, of my then next-door neighbour and of myself:—

My Neighbour.

Number in family	5		
Number of servants	2		
Number of rooms	10		
Gas and coal costs for one year for lighting, cooking, and heating	£58	0	0
Costs of maids (all in)	£200	0	0
	£258	0	0

Myself.

Number in family	5		
Number of servants	1		
Number of rooms	10		
Electricity and coal cost for one year for lighting, heating, cooking, and cleaning, washing, ironing, &c.	£38	0	0
Cost of maid (all in)	£100	0	0
	£138	0	0

These figures do not take into consideration the cost and savings, respectively, of decorations, cleaning the house, &c. It is possible to continue with similar comparisons, but it is unnecessary. If all those engaged in the electrical profession who are not taking their own medicine were to do so, the snowball effect would be considerable, and they would, incidentally, help themselves by helping others.

Modern Electric Homes, Ltd.
W. A. Gillott, *Manager.*

London, *September 7th*, 1929.

[Will our correspondent, Mr. W. Simpson, kindly forward his present address, letters addressed to him having been returned marked "not known."—Eds. Elec. Rev.]

Domestic Wireless.

I have read Mr. G. E. Moore's article on "Laying-on the Domestic Wireless" with considerable interest, as his set in many respects corresponds with my own, but I do not agree with his conclusions as to mains-driven sets.

Admitting that for commercial expediency we are all shortly to be cursed with a.c. supply, to the detriment of our eyesight and general convenience, he must envisage some sort of rectifier, or so-called eliminator. As against batteries, whether primary or even secondary, the eliminator is dependent on the mains, whereas the bulk of B.B.C. subscribers use gas, or even oil in the country (shocking!); also, the eliminator needs switching—for use and disuse—an extra operation. The cost of an eliminator of even mediocre performance is more than the average listener pays for his whole wireless outfit.

Rectifier sets have the further advantages of giving anything from a loud hum to that continuity of noise known as "absolute silence," their voltage fluctuates with that of the mains unless a stabilising device be added, they are liable to give the fortunate owner a nasty shock if handled incautiously, and to burn out the set if the owner is ignorant of his internal connections.

Lastly, they *are* dependent on the mains, and in the event of a mains failure, or a general strike, when the "wireless" is of supreme importance, the user will be let down.

For the country and the colonies I believe batteries, and primary cells at that, will for many years be the usual source of supply.

Mr. Moore admits that his primary anode battery has been in use 12 months, and is still undiminished. What more does he require?

A. Mortimer Codd.

Esher, *September 9th*, 1929.

My Electric House.

It was a coincidence that Mr. R. H. Rawll's reply to my inquiry respecting the size of his family should have appeared in the same issue as that in which my notes on water-heater consumption were published. He will thereby be already aware that we are in agreement upon the fact that considerable differences of consumption may occur between families of the same size, due to their differing habits. But I do not go so far as to agree with Mr. Rawll that he was justified in deliberately omitting the size of his family from the information he gave, for we really cannot make any scientific use of such data unless we know all the factors concerned. Nor do I agree with his view that it is entirely wrong to quote consumption figures in terms of units per person per day. If the figures quoted are averages from a number of observations, they will generally be of considerable value and will only be at fault when applied to exceptional cases. But if, on the contrary, a figure is given in propaganda literature which is not an average from a number of observations, then I agree that it may be valueless. I think the correct viewpoint is not that such a method of expression is wrong, but that the figures quoted must be averages and not isolated ones.

An examination of Mr. Rawll's water-heater consumption figures can now be made, and it would appear that his fears concerning their magnitude have some foundation. During the whole year he used energy at approximately the rate of 224 units per month. Counting Mr. Rawll's family as of three persons and comparing this figure with those I noted, it appears that his consumption was above the average for families three times as large as his. Even so, it is below the maximum recorded for *isolated* cases of three-person families. Had Mr. Rawll not been an engineer, observations on the matter would probably have to be left at this point, but a knowledge of his profession enables the assumption to be made that no deliberate waste of hot water was customary in his household. The large consumption must therefore be accounted for partly by the particular family circumstances which Mr. Rawll has mentioned and partly by the fact that he uses a converted hot water system, designed originally for coal firing and without thermostatic control. I am, personally, inclined to attribute it more to the second circumstance than to the first.

L. G. A. Sims.

Birmingham, *September 14th*, 1929.

Synchronous Motors.

["Non-Mathematician" would like to thank all the gentlemen who have so kindly assisted him in his query on the synchronous motor, which appeared in our "Correspondence" columns on August 9th, 1929.—Eds. Elec. Rev.]

The Electrical Power Engineers' Association.

The eleventh annual dinner to the members of the National Executive Council of the E.P.E.A. is to be held at the Hotel Cecil, Strand, W.C.2, on Saturday, October 19th, 1929. Tickets (7s. 6d. each) can be obtained from technical representatives or from Mr. P. Gordon Hieatt, hon. secretary, Southern Division, 25, Parkhurst Road, Bowes Park, N.22.

Legal.

Derbyshire and Notts. Power Co. Summoned.

Proceedings were instituted before the Derby magistrates, on September 10th, against the Derbyshire and Notts. Electric Power Co. for a contravention of the Factory Acts. It was shown by the evidence that Messrs. Balfour, Beatty & Co. were carrying out alterations at the works, and during that time certain cables were put out of action. Other cables carrying current at 6,600 V were being utilised, when George V. House, employed by the engineers, was cleaning up the debris on a Sunday morning. House stood on a wooden platform, and was told to be careful of the live cables, three feet from where he was working. After giving this warning, the foreman went to other parts of the building, and, upon returning a few minutes later, he found House lying on the floor unconscious, with extensive burns on his head and arms. The man died from septic poisoning a few weeks later. Burns were afterwards found on the insulating tape of a near-by cable and the screen between which the man was found lying. Mr. Saywell (who appeared for the Public Prosecutor) said the Bench had to decide whether the tape insulating this cable was effective, and, if dangerous, whether other efficient precautions had been taken.—The further hearing of the case was adjourned until Tuesday last.

Spurious "Osram" Lamps.

With reference to the report appearing in our issue of September 6th, p. 404, under the above heading, the General Electric Co., Ltd., asks us to state that the Henry Tattersall who was convicted at the Hull Police Court on August 26th for selling spurious Osram lamps, was in no way connected with the firm of Henry Tattersall, Ltd., of Spotland Bridge, Rochdale.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

4,692. "Switches." L. Satchwell. February 14th, 1928. (Cognate application, 14,850/28.) (317,771.)

11,200. "Direct-current machines with shunt and series excitation." International General Electric Co., Inc. April 16th, 1927. (288,988.)

11,528. "Contacts for electrical switches and the like." G. H. Scholes, F. J. Pearce, and G. H. Scholes & Co., Ltd. April 19th, 1928. (Cognate application, 14,598/28.) (317,715.)

11,892. "Magnet systems for converting electrical into acoustic oscillations, and *vice versa*." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 2nd, 1927. (289,804.)

12,172. "Sound cones for loud-speakers." Rheinische Holzwerke Ges. August 1st, 1927. (289,406.)

13,945. "Electric switches." Dr. A. Scherbius and E. R. Ritter (trading as Scherbius & Ritter). July 1st, 1927 (293,018.)

14,381. "Electrical insulating and filling materials, more particularly liquid electrical insulating materials, and processes for the manufacture thereof." Berry, Wiggins & Co., Ltd., and H. H. Holmes. May 16th, 1928. (Cognate application, 14,382/28.) (317,717.)

14,846. "Automatic and semi-automatic exchange systems." Standard Telephones and Cables, Ltd., E. P. G. Wright and J. H. E. Baker. May 21st, 1928. (317,745.)

14,856. "Calculating device for use in connection with wireless receivers." H. Parker. May 21st, 1928. (317,746.)

14,858. "Electric baking and roasting ovens." A. D. Widstrom. May 21st, 1928. (317,773.)

14,870. "Musical instrument provided with a keyboard and working through the periodic illumination of a photoelectric cell." Soc. de Recherches et de Perfectionnements Industriels. May 19th, 1927. (290,984.)

14,884. "Tuned inductances and transformers." K. E. Edgeworth. May 21st, 1928. (317,749.)

15,126. "Holders for thermionic valves." T. A. W. Robinson. May 23rd, 1928. (317,873.)

15,179. "Arrangement for mounting telephone selectors and pole-changers used in long-distance communication installations." Siemens & Halske Akt. Ges. July 30th, 1927. (294,872.)

15,197. "Protective arrangements for electric power lines or the like." R. O. Kapp and C. G. Carrothers. May 23rd, 1928. (Cognate applications, 17,053/28, 18,028/28, 24,528/28, and 32,861/28.) (317,874.)

15,198. "Telephone systems." Automatic Telephone Manufacturing Co., and P. F. Gunning. May 23rd, 1928. (317,817.)

15,247. "Electrically-driven vibratory devices, such as tuning forks." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). May 24th, 1928. (317,878.)

15,248. "Automatic and semi-automatic telephone systems." Standard Telephones and Cables, Ltd., E. P. G. Wright, J. H. E. Baker, and A. H. Cameron. May 24th, 1928. (317,879.)

15,266. "Inductive loading of electric cables." Siemens Bros. & Co., Ltd., and A. E. Foster. May 24th, 1928. (317,883.)

15,267. "Wireless installations." H. W. Hamlett. May 24th, 1928. (Cognate application, 27,107/28.) (317,884.)

15,268-70. "Coin-actuated controlling devices for electrical circuits." H. W. Hamlett. May 24th, 1928. (317,885-7.)

15,417. "Quick-action electric switches." F. B. Dehn (Pemberthy Injector Co.). May 25th, 1928. (317,897.)

15,442. "Thermionic cathodes." Westinghouse Electric and Manufacturing Co. June 1st, 1927. (291,400.)

15,468. "Electric telegraphs." Electrical Research Products, Inc. July 19th, 1927. (294,166.)

15,494. "Switchgear for electric purposes and the like." H. G. Turnell. May 26th, 1928. (317,901.)

15,558. "Electro-mechanical vibrators." Ateliers J. Carpentier. May 28th, 1927. (291,116.)

15,869. "Effecting chemical reactions in gases by means of electrical discharges." P. H. Hull and Imperial Chemical Industries, Ltd. May 31st, 1928. (317,920.)

16,300. "Control of the power-factor and voltage conditions of electric induction furnaces." N. R. Davies, C. R. Burch, F. W. Capper, and Associated Electrical Industries, Ltd. June 5th, 1928. (317,931.)

17,533. "Gas controllers, electric time switches, and other timing devices." Horstmann Gear Co., Ltd., and A. Horstmann. June 18th, 1928. (317,944.)

18,497. "Reciprocating and oscillating and like electric motors." R. J. Carruthers. June 26th, 1928. (317,947.)

18,717. "Electric heating devices for welding, soldering, and annealing." E. Schroder. June 28th, 1927. (292,985.)

20,093. "Means for charging storage batteries." Eclairage des Véhicules sur Rail. January 10th, 1928. (303,825.)

20,205. "Radio apparatus." M. G. Scroggie. July 11th, 1928. (317,956.)

20,434. "Ammeter." A. C. Spark Plug Co. July 13th, 1927. (293,842.)

21,012. "Transmission systems for use in electric signalling systems." Marconi's Wireless Telegraph Co., Ltd. July 20th, 1927. (294,213.)

21,095. "Releasing device for electric switches." Schiele & Bruchsaler-Industriewerke Akt. Ges. July 20th, 1927. (294,219.)

21,106. "Electric locking of hand-levers for railway signalling systems and the like." Tyer & Co., Ltd., and E. W. Baker. July 20th, 1928. (317,965.)

21,136. "Process and apparatus for electrolytically manufacturing metal sheets and tubes." E. Kelsen. July 25th, 1927. (294,541.)

21,947. "Alternating-current meters." International General Electric Co., Inc. July 28th, 1927. (294,666.)

22,022. "X-ray installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 5th, 1927. (295,028.)

22,423. "Adjustable sliding plate or bed for dynamos or other belt-driven machines." R. N. Chadwick. December 13th, 1928. (317,976.)

22,880. "Electric switches." British Thomson-Houston Co., Ltd. August 8th, 1927. (295,285.)

25,155. "Electric switches or circuit interrupters." W. A. Coates and Associated Electrical Industries, Ltd. September 1st, 1928. (318,000.)

25,406. "Radio receiving apparatus." H. C. Willson. September 4th, 1928. (318,003.)

25,907. "Electrical switch boxes." R. Bosch Akt. Ges. September 12th, 1927. (297,033.)

26,091. "Electric regulator." R. Unzeitig. September 13th, 1927. (297,056.)

27,751. "Mechanism for producing step-by-step movements, particularly applicable to the switches of electrical control systems." Forges et Ateliers de Constructions Electriques de Jeumont. May 8th, 1928. (Addition to 300,895.) (311,264.)

28,573. "Method of mounting and driving dynamos or electric generators of motor vehicles." Wolseley Motors (1927), Ltd., and O. Boden. October 5th, 1928. (Cognate application, 9,492/29.) (318,031.)

31,597. "Electric switches, bell pushes, and the like." J. A. Crabtree and B. G. Harrison. October 31st, 1928. (318,045.)

35,882. "Cross-field direct-current dynamo with adjustable short-circuit current strength." Siemens Schuckertwerke Akt. Ges., H. Richter, and M. Dieterlen. December 5th, 1928. (318,064.)

36,468. "Miners' electric lamps." E. Musy. March 15th, 1928. (307,875.)

1929.

522. "Direct-current electrical measuring instruments" G. E. Lloyd and Electrofio Meters Co., Ltd. January 7th, 1929. (318,075.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 11th:—

Dorian Wireless (lettering and design). No. 500,027. Class 8. Radio-telephonic and telegraphic apparatus.—Dorian Wireless Co., Ltd., 315, Regent Street, W1.

Supacon (lettering and design). No. 501,917. Class 8. Electric cables.—Superlamp, Ltd., 92-94, Paul Street, E.C.2.

Inspro. No. 504,350. Class 50. Electrical insulating material.—Lewis, Falkner & Battersby, 16-17, Devonshire Street, E.C.3.

Synthetic Bell Chimes.

The voice of "Big Ben," London's famous Westminster clock, has been synthetically reproduced in the United States by radio station KDKA of the Westinghouse Electric and Manufacturing Company, which first introduced the sound of the great old timekeeper to its listeners by relaying it from London through a short-wave receiving set. The sound is used as a background of the programme, whether it be talking or music, and when the sound is described as synthetic, exactly that is meant. It does not mean that a bell has been made which approximates the sound made by the London timepiece; instead, "Big Ben" is imitated by frequencies imposed on the radio set in Pittsburgh, which do not become sound until they reach the radio speaker. The tone is created by a number of oscillators, each one giving a certain frequency; they were selected by analysis of "Big Ben's" tones, and by combining the frequencies the same signal is carried to the transmitter as would be produced by sounding the bell itself into a microphone. To ensure absolute accuracy, the artificial bell is set off by a seconds-beat pendulum clock, which operates in a vacuum. The pendulum is made of an alloy, which is unaffected by changes in temperature, and there are no mechanical connections to the clock, only electrical. The impulse from the pendulum controls a set of gears which, in turn, close the contact between the pendulum and the group of oscillators exactly on the hour.